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VOLUME 11 • JANUARY 1953 • NUMBER 1 JOURNAL OF ORAL SURGERY

Fibrous (fibro-osseous) dysplasia of jaw bones

■ *Adolph Berger,* D.D.S., and Henry L. Jaffe,† M.D., New York*

The literature contains many reports of cases in which a maxilla or mandible, or even one or both maxillae and the mandible, have become enlarged by a lesion developing from within and consisting of fibrous and osseous tissue in various proportions. Frequently these reports relate only to individual cases, and in many the pathologic findings recorded are meager; others report groups of cases. Among these group reports, the paper published in 1937 by Phemister and Grimson[1] is important in that it attempts to present a unified conception of these jaw lesions, on the basis of clinical, roentgenographic and pathologic findings. The present report, which is based on a study of 12 cases, considers the condition from all these aspects. It also shows how these jaw lesions fit into the picture of fibrous dysplasia of bone as a whole.

The general name by which Phemister and Grimson referred to the lesion in question was "fibrous osteoma of the jaws." They stated, however, that the terms "ossifying fibroma" and "osteofibroma" also could be used, especially for those lesions in which the fibrous stroma was considerable in amount and the osseous tissue with which it was interspersed was mainly immature. Other names which have been used, and which occasionally are still used, for the jaw lesion in question include "central osteoma," "exostosis," "localized osteitis fibrosa," "localized fibrous osteodystrophy," "hypertrophic localized osteitis" and "localized leontiasis ossea."

In connection with the development of the concept of fibrous dysplasia, it was recognized by one of us (H.L.J.) as early as 1938 that the so-called fibrous osteoma of the jaw bones was closely analogous, pathologically, to the condition which, in relation to limb and trunk bones, was

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1. Phemister, D. B., and Grimson, K. S. Fibrous osteoma of the jaws. Ann. Surg. 105:564 (April) 1937.

being designated as fibrous dysplasia of bone.[2] Subsequent experience, both with fibro-osseous jaw lesions and with fibrous dysplasia in general, has sustained this conception.[3] The point of view was subsequently reached by Schlumberger,[4] who, in 1946, expressed the opinion that "fibrous osteoma" of jaw bones represents the same lesion which, in relation to long bones, is designated as "fibrous dysplasia."

Pugh,[5] in 1945, expressed the same opinion. He pointed out that fibrous dysplasia of the bones of the skull may occur independently, or in conjunction with, fibrous dysplasia of limb or trunk bones, or in both limb and trunk bones. Furthermore, he favored the idea that the cranial and facial deformity known as "leontiasis ossea" represents, in most cases, fibrous dysplasia of the bones of the skull. Windholz,[6] in 1947, emphasized the idea that skull bones (including jaw bones) are frequent sites of fibrous dysplasia. He estimated (1) that in about 10 per cent of the cases of fibrous dysplasia involving only one bone (monostotic fibrous dysplasia), that bone will be a skull bone; (2) that in about 50 per cent of the cases of fibrous dysplasia in which a considerable number of bones are affected, one or more will be skull bones, and (3) that in practically 100 per cent of the cases of fibrous dysplasia in which the skeletal involvement is widespread and severe, there will be some implication of the skull. Furthermore, he expressed the belief that many of the cases which have been cited in the literature as instances of "unilateral cranial hyperostosis," "hemihypertrophy of the cranium" and "leontiasis ossea" actually represent cranial expressions of fibrous dysplasia of bone.

■ *General Concept of Fibrous Dysplasia of Bone*

Fibrous (fibro-osseous) dysplasia of bone has, as its central and constant feature, a characteristic kind of skeletal lesion developing in the interior of affected bones.[7] In any particular case, one, several, or many bones may be involved, and part or much of the interior is occupied by a tissue which is basically fibrous and gritty, though it may also present cystic regions and even sometimes foci of cartilage. In some instances, the skeletal aberration apparently constitutes the entire disorder. In others, there is an association of the skeletal aberration with the presence of one or more nonelevated light yellow or yellow-brown areas of cutaneous pigmentation. Indeed, the vast majority of the cases of fibrous dysplasia shows only the dysplastic skeletal changes (in one, several, or many bones) or such skeletal changes along with some abnormal cutaneous pigmentation.

The small percentage of cases remaining can be considered as representative of the full-blown form of the disorder. In this form, specifically, the patient presents the skeletal changes (usually together with some abnormal pigmentation) and also shows, or has shown, pre-

2. Lichtenstein, L. Polyostotic fibrous dysplasia. Arch. Surg. 36:874 (May) 1938.

3. Lichtenstein, L., and Jaffe, H. L. Fibrous dysplasia of bone. Arch. Path. 33:777 (June) 1942.

4. Schlumberger, H. G. Fibrous dysplasia (ossifying fibroma) of maxilla and mandible. Am. J. Orthodont. (Oral Surg. Sect.) 32:579 (Sept.) 1946.

5. Pugh, D. G. Fibrous dysplasia of skull: probable explanation for leontiasis ossea. Radiology 44:548 (June) 1945.

6. Windholz, F. Cranial manifestations of fibrous dysplasia of bone; their relation to leontiasis ossea and to simple bone cysts of vault. Am. J. Roentgenol. 58:51 (June) 1947.

7. Jaffe, H. L. Fibrous dysplasia of bone. Bull. New York Acad. Med. 22:588 (Nov.) 1946.

mature skeletal maturation and precocious puberty, sometimes together with hyperthyroidism and other abnormalities. It is these full-blown cases that are commonly denoted as instances of Albright's disease.[8] McCune and Bruch[9] also called attention to them in 1937 and mentioned, as did Albright, a number of cases previously reported in the literature under various names. In spite of their relatively small number, these cases bulk large in the literature because their spectacular qualities make them attractive subjects for reporting.

It has been estimated[7] that for every case of the florid type there are 20 or 30 cases of the type in which the fibrodysplastic involvement of the skeleton is limited to one bone (perhaps a jaw bone) or at most a small number of bones and is not associated with any striking cutaneous pigmentation, apparently not with any skeletal precocity, and certainly not with sexual precocity or hyperthyroidism.

Nothing is known of the etiology of the condition, but the systemic character of the disease complex as a whole strongly suggests that it has its basis in some deep-rooted developmental defect, though it does not show any familial or hereditary factor. In a sense, the individual bone lesion may be conceived as a hamartoma; that is, a tumor-like malformation resulting from flaws of development and characterized by defects of tissue combination. Jaw lesions representing fibrous dysplasia support the idea of a developmental defect, for they often are already manifest in childhood, they usually grow slowly during the general growth period, and they often become static after general growth has ceased.

■ *Manifestations of Fibrous Dysplasia in Jaw Bones*

In all but one of the cases dealt with in this paper, the sole complaint related to a jaw bone. It was assumed in all these cases that the fibrous dysplasia was limited to the affected jaw region (or at least to that region and some adjacent part of the skull) and was not associated with lesions in limb or trunk bones. This assumption seemed to be a relatively safe one, since it is likely that if the jaw bone involvement in these cases represented merely one facet of a fibrous dysplasia involving other skeletal areas, there would surely have been some pertinent complaint or clinical finding relating to them.

CLINICAL CONSIDERATIONS—Instances of fibrous dysplasia limited to a jaw bone are not common. As indicated, most of the pertinent literature consists of reports on one case, or at most a few cases. Among the articles studied which report on ten or more cases are those by Furedi,[10] Phemister and Grimson,[3] and Schlumberger.[4]

It appears that the maxilla is involved slightly more often than the mandible. As in fibrous dysplasia in general, fibrous dysplasia of jaw bones is more common in females than in males. A swelling of the affected maxilla or mandible frequently is noted by the time the patient has

8. Albright, F., and others. Syndrome characterized by osteitis fibrosa disseminata, areas of pigmentation and endocrine dysfunction, with precocious puberty in females; report of 5 cases. New England J. Med. 216:727 (April 29) 1937.

9. McCune, D. J., and Bruch, H. Osteodystrophia fibrosa; report of case in which condition was combined with precocious puberty, pathologic pigmentation of skin and hyperthyroidism, with review of literature. Am. J. Dis. Child. 54:806 (Oct.) 1937.

10. Furedi, A. A study of the so-called osteofibromas of the maxilla. D. Cosmos 77:999 (Oct.) 1935.

reached adolescence. It is only infrequently that the cases come to clinical light after the patient has reached the age of 30 or 35.

Whatever the age of the patient when he comes under treatment for the condition, inquiry usually reveals that the swelling is of long standing, in some instances having been present for years. It is nearly always the swelling that first draws attention to the condition, for the lesion itself seldom is painful. Occasionally, the facial asymmetry is so slight that it has gone unnoticed by the patient until a pulpitis or an infection about the root of a tooth in the region led the patient to seek dental care, and this in turn led to the discovery of the abnormality in the jaw.

When observed over a period of time, the swelling may seem to be stationary, or at least be found to be increasing extremely slowly. In only an occasional case is there a history of rapid enlargement of the affected jaw bone. In a case in which a maxilla is involved, deformity of the orbit and ocular proptosis sometimes occurs. Occasionally, also, the progressive growth of the lesion may cause pressure which noticeably compresses one or another of the local nerves.

Examination usually shows that the investing integument and oral mucosa are intact. Accordingly, unless there is some infection or other complication, the integument glides smoothly over the affected bone area, as it would glide over normal underlying bone. Palpation reveals that the affected region is of a hard, bony consistency. Ordinarily it is not tender to palpation or much disturbed in its function.

ROENTGENOGRAPHIC FINDINGS—The roentgenogram is helpful in arriving at the diagnosis. An affected maxilla shows expansion of the contour of the bone. The greatest degree of involvement of the bone is likely to be found in the region of the first and second molars. Also, when a maxilla is affected, the antrum often is encroached on and occasionally may be almost completely obliterated. The cortex of the bone, though thinned, is still recognizable, and ordinarily there is no evidence of new periosteal bone formation. The shadow cast by the affected area of the maxilla often is densely radiopaque. This radiopacity indicates that the abnormal fibro-osseous tissue in the interior of the affected bone is more osseous than fibrous. In the occasional cases in which the replacement tissue in the maxilla is not very osseous, the roentgenogram, of course, is not one of dense radiopacity. Even in these cases, however, it is not likely that the abnormal region will cast a multilocular shadow.

In the mandible, it is usually the body of the bone that is most involved. The contour in the affected region is expanded and the cortex thinned. It is only rarely that the lesional region gives a radiolucent, multilocular shadow. Usually it is only moderately and spottily opaque, the opacity somewhat suggesting that of ground glass.

PATHOLOGIC FINDINGS—The replacement tissue in the interior of the lesional region of a bone affected with fibrous dysplasia is, in general, fibro-osseous. There may be considerable variation in the character of this tissue from lesion to lesion, however, and even within different

regions of the same lesion, specifically in regard to the proportion of osseous to fibrous elements. The tissue usually is tough but compressible, and may be evenly whitish or reddishly speckled. It may be gritty throughout because of the presence everywhere within it of newly formed trabeculae of immature bone. This gritty tissue represents the characteristic replacement tissue of fibrous dysplasia lesions. Such lesions, however, may show smaller or larger nongritty, highly collagenous regions in which few if any trabeculae are to be seen. Then again, in some regions or some lesions so much new bone may have formed in the connective tissue substratum that the latter sinks into the background, and the replacement tissue has a definitely osseous character. In an occasional lesion (especially in predominantly fibrous regions) focal degeneration of, or hemorrhage into, the replacement tissue may have led to the formation of smaller or larger secondary cysts. In regions of organizing hemorrhage, a few scattered or clumped multinuclear giant cells may be observed. In an occasional lesion, some nests of foam cells within the fibrous tissue may be found. These may be seen in connection with hemorrhage or focal degeneration of the connective tissue cells and hardly represent a noteworthy feature of the condition except that they may lead to a mistaken diagnosis of lipogranulomatosis (Schüller-Christian disease).

When the jaw bone is involved, the replacement tissue of fibrous dysplasia may show precisely the same anatomic variations from case to case as were outlined earlier in connection with fibrous dysplasia in general. Particularly in the maxilla, however, the lesional tissue is likely to be strongly on the osseous side. The osseous trabeculae may be quite thick, be composed of rather mature osseous tissue, and show numerous cement lines. Roentgenographically, those fibrodysplastic jaw lesions in which the osseous element is dominant tend to show considerable ground-glass radiopacity or to be densely radiopaque almost throughout. Sometimes jaw lesions of fibrous dysplasia are encountered in which there is relatively little osseous tissue and in which much of the new bone present is in the form of spherules. Such anatomic appearances are to be noted also in fibrodysplastic skeletal lesions elsewhere than in jaw bones. The roentgenographic shadow cast by such lesions will be predominantly radiolucent, of course, and simulate the shadow cast by a jaw-bone cyst of one kind or another.

It should be pointed out finally that in some of the fibro-osseous lesions of jaw bones the osseous element of the tissue pattern suggests osteocementum rather than conventional osseous tissue. We are not referring here to hypercementosis about the tooth roots, nor to those cases, not uncommon, in which a dense, compact mass of osteocementum develops about the roots of one or more teeth. Instead, the reference is to those lesions in which there is an expansile, tumor-like involvement of a mandible or maxilla and in which the clinical picture is analogous to that of fibrous dysplasia of jaw bones. These jaw lesions with fibrous tissue and osseous tissue simulating osteocementum actually belong in the category of fibrous dysplasia and apparently represent dysplasia of the odontogenic tissue of purely mesoblastic origin.

■ *Representative Cases*

CASE 1—A girl, aged 17 when first seen, had as her chief complaint a diffuse swelling of the left side of the mandible, apparently of only a few weeks' standing. Some weeks previously, a carious left lower molar had been removed. At first it was assumed that the swelling of the mandible was incidental to the extraction, but since the swelling persisted, a roentgenogram of the mandible was taken before treatment was begun. Even at this point, the real nature of the lesion was not suspected and it was believed that the patient had osteomyelitis of the mandible.

Clinical examination revealed no abnormalities except a rather even bulge along the left side of the mandible which was apparent on inspection (Fig. 1, above left). Interestingly enough, a snapshot taken three years previously (Fig. 1, above right) showed the swelling to be present at that time although the patient had not been aware of it. Local examination showed that function of the jaw was normal and that the outer and intraoral soft parts over the affected parts of the mandible were not remarkable.

The roentgenograms (Fig. 1, center and below left) revealed that the enlargement of the mandible extended from the coronoid process to the median line on the left side. Over part of the expanded region, the cortex of the bone was thinned. The lesional region appeared to be of mottled radiopacity. From these pictures, it would be expected that the tissue removed in the course of biopsy would be fibro-osseous and that much of the osseous tissue would be of a rather mature type.

To establish the diagnosis, tissue was removed by incisional biopsy. The tissue sections showed the presence of thinned trabeculae which were separated by vascular and cellular fibroplastic tissue. Some of the trabeculae were surrounded by a layer of osteoblasts. There was little evidence of bone destruction. One of the tissue sections showed a region in which the lesional tissue was predominantly fibrous. Figure 1, below right, shows a photomicrograph of the tissue removed at biopsy. On the establishment of the diagnosis, and in view of the innocuousness of the condition which must have been present for a long time, it was decided not to carry out any further intervention.

CASE 2—A 15 year old girl, when first seen, complained of a carious lower right second molar. The dentist who had seen her before she came under the care of one of us (A.B.) noted that there was facial asymmetry (Fig. 2, above left) and took dental roentgenograms which led him to decide against extraction of the tooth.

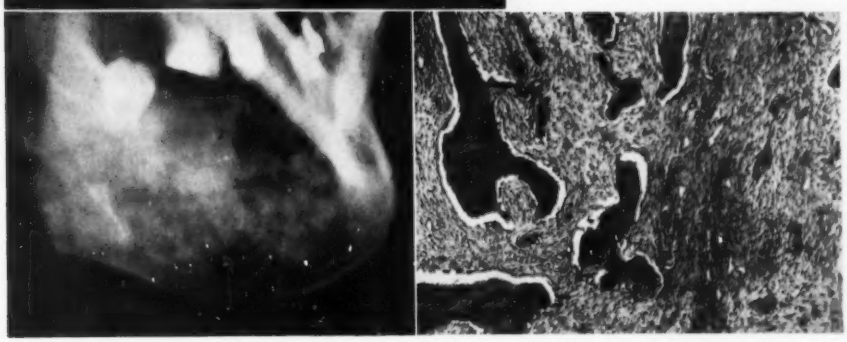
We found that the swelling of the right side of the mandible was not associated with any disorder of the temporomandibular function. There was definite evidence of pulpitis caused by a carious tooth, but the swelling of the mandible was unrelated to this. A roentgenogram of the lower jaw (Fig. 2, above right) showed that the right side of the mandible was enlarged from the coronoid process to the median line. The lesional region, however, was more radiopaque than the lesion on the left side of the mandible in Case 1.

An incisional biopsy was done under local anesthesia. The lesional tissue was found to be dense and osseous. Histologi-

cally, the slides prepared from the tissue removed showed that the osseous trabeculae were extremely thick. Between these trabeculae there was dense fibroblastic tissue. As suspected from the roentgenogram, the lesional tissue was osseous, and it was this quality that gave the lesional region its radiopacity (Fig. 2, below).

No surgical intervention was done beyond the biopsy. The patient was seen

Fig. 1.—Case 1. Left: Patient at time she first presented herself. Right: Same patient as she had appeared three years earlier. Note that left mandibular region was already enlarged



Left: Roentgenogram showing expansion of left side of mandible and mottled radiopacity of lesional region. Below left: Lateral view of mandible showing even more strikingly the mottled radiopacity of lesional region. Below right: Photomicrograph of area in tissue slide prepared from biopsy specimen. Note cellular and vascular fibrous stroma and newly formed osseous tissue in stroma

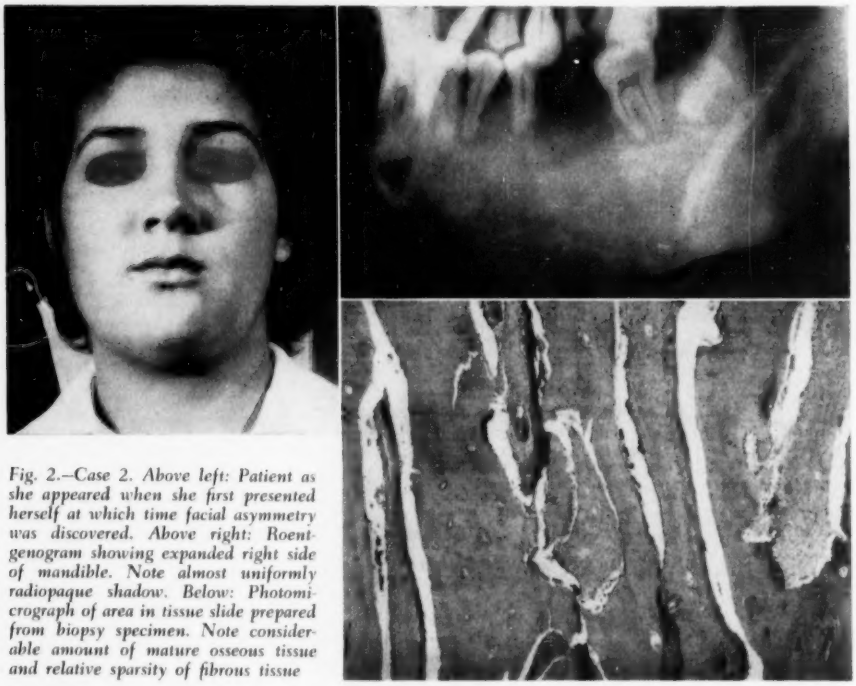


Fig. 2.—Case 2. Above left: Patient as she appeared when she first presented herself at which time facial asymmetry was discovered. Above right: Roentgenogram showing expanded right side of mandible. Note almost uniformly radiopaque shadow. Below: Photomicrograph of area in tissue slide prepared from biopsy specimen. Note considerable amount of mature osseous tissue and relative sparsity of fibrous tissue

again 15 years later and there was no further change in the facial outline. In roentgenograms taken at this time, the lesion presented essentially the same appearance that it had presented originally.

CASE 3—A woman, aged 46 when first seen, gave a history of swelling of the right side of the mandible of about five years' standing, but stated that it was pain which had developed recently that had prompted her to seek medical care. This pain was an ache in her right ear of one month's duration, but no pathologic condition was found in relation to the ear to explain the pain. Oral examination revealed a bony swelling in the right anterior part of the mandible (Fig. 3, above left). The mass extended from near the midline to the bicuspid region, and was covered with intact normal mucous membrane. The mass bulged on both the labial and lingual side and was tender to deep pressure. The patient stated that during waking hours there were frequent episodes of spasmodic pain which radiated to the ear. The bicuspids within the affected area were free of caries but moderately loose. A roentgenogram (Fig. 3, above right) showed radiopacities in the region of the lesions and some expansile enlargement of the mandible.

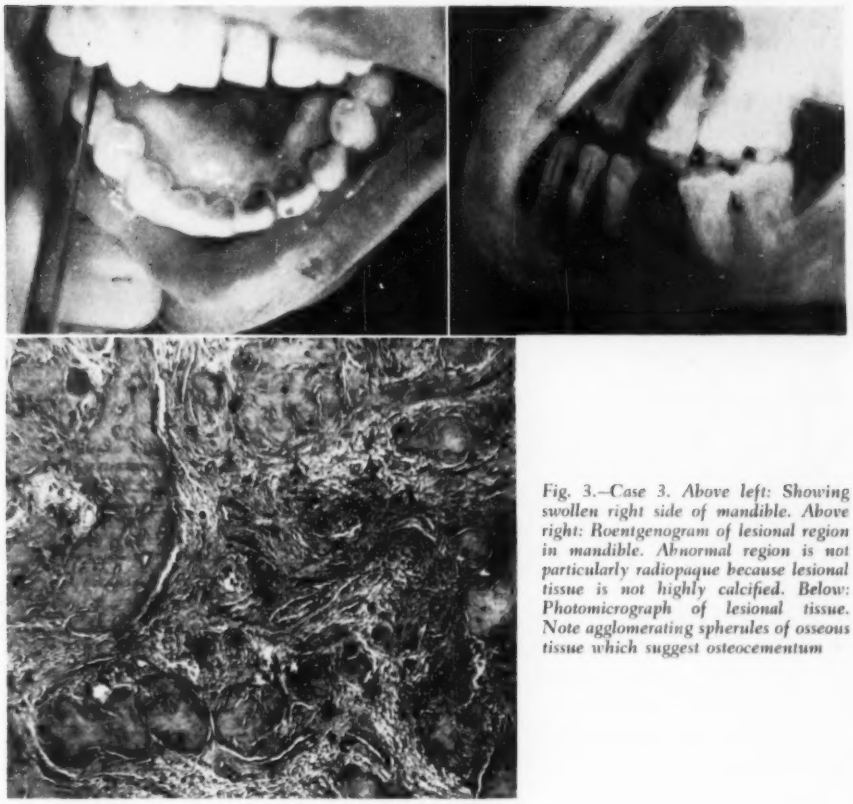


Fig. 3.—Case 3. Above left: Showing swollen right side of mandible. Above right: Roentgenogram of lesional region in mandible. Abnormal region is not particularly radiopaque because lesional tissue is not highly calcified. Below: Photomicrograph of lesional tissue. Note agglomerating spherules of osseous tissue which suggest osteocementum

Surgical intervention consisted of removal of the abnormal tissue, along with the teeth in the region, through a labial approach. The abnormal tissue which extended toward the margin of the mandible was curetted away.

Tissue sections showed the pathologic material to be composed of large amounts of osseous tissue suggestive of osteocementum rather than of conventional osseous tissue (Fig. 3, below). The osseous tissue was present in the form of small globules which, in places, tended toward agglomeration. This osseous tissue was set in a vascular fibroblastic substratum.

The patient's condition was followed for two years and there was no recurrence of the difficulties.

CASE 4—A girl, aged 12 when first seen, presented a history of swelling of the right cheek of several months' standing (Fig. 4, above left). The mother was under the impression that lately the swell-

ing had been increasing in size. Examination showed that the teeth were normally erupted and in good condition and alignment, except that the third molar had not yet erupted. There was pronounced asymmetry of the right maxillary region, caused by a swelling which was otherwise asymptomatic. Intraorally, the outer wall of the maxilla appeared as a bulging mass which extended from the cuspid region to the tuberosity (Fig. 4, right). The overlying soft parts were normal in appearance and in texture.

A roentgenogram (Fig. 4, below left) showed that the lower two thirds of the maxillary sinus presented a homogeneous

Fig. 4.—Case 4. Left: Patient at time she first presented herself. Swelling of right side of cheek, of several months' duration, is visible

Right: Expanded maxilla as seen from labial surface

Left: Roentgenogram of lesional region in maxilla. Note uniform radiopacity of this area

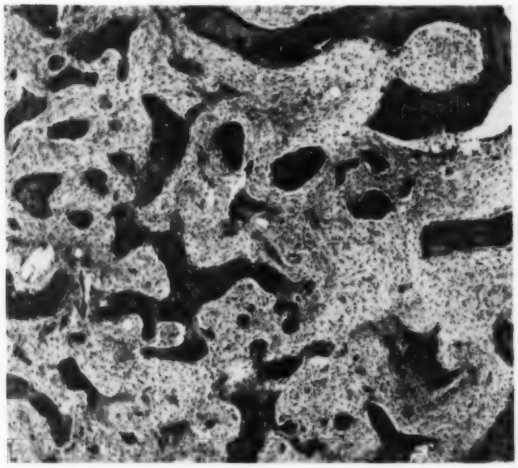


Fig. 5.—Case 4. Photomicrograph of area in tissue slide prepared from material removed at biopsy. Note fibrous stroma in which osseous tissue is being laid down in considerable amounts. Some of the bone is present in form of thick trabeculae composed of mature lamellar bone

radiopaque shadow. An incisional biopsy was done under local anesthesia. The block of tissue removed was of firm consistency and gritty. The tissue sections (Fig. 5) revealed the presence of numerous osseous trabeculae set in a connective-tissue substratum. In some regions, the connective tissue presented foci of calcification suggestive of cementicle formation.

No intervention other than the biopsy was undertaken. The patient was seen periodically during the ensuing six years. The affected maxilla had not undergone further enlargement. It was felt that the facial prominence could be reduced by excising part of the growth from the labial aspect. This idea was rejected, however, because of the slightness of the patient's clinical difficulty.

CASE 5—A man, aged 21 when first seen, came under medical attention because of facial asymmetry and increased lacrimation (Fig. 6, above left). The left side of his face was somewhat more prominent than the right, and the left eye appeared smaller than the right. There was evidence also of increased lacrimation on the left side. He stated that about two years before, the left upper cuspid and lateral incisor, though not diseased, had been removed along with some bone from the maxilla. This had been done in an attempt to reduce the facial enlargement. The teeth had been replaced by a fixed bridge. Pressure of the bridge provoked massive hypertrophy of the gum, so that when the patient was seen the bridge restoration was found almost completely covered by hypertrophic tissue. He sought relief now only because that tissue bled profusely when irritated by mastication or by brushing of the teeth.

Roentgenographic examination disclosed that a large portion of the left maxillary bone was almost homogeneously radiopaque (Fig. 6, above right). Roent-

genographic study disclosed further that the nasal, frontal and sphenoid bones were similarly affected, and that portions of the nasal cavity, maxillary sinus and frontal sinus, and some of the ethmoid cells had been obliterated (Fig. 6, below left). Also, the base of the skull was extremely thickened and radiopaque, and the pituitary fossa appeared much reduced in size (Fig. 7, above).

An incisional biopsy was done under local anesthesia, and a block of lesional

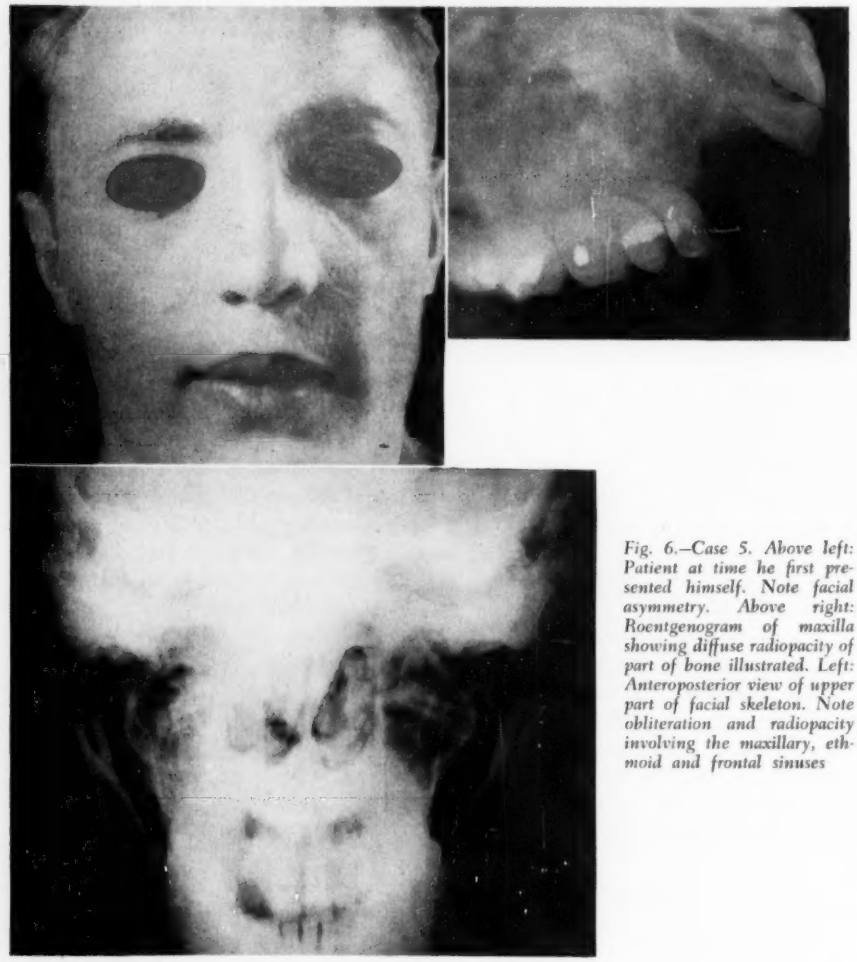
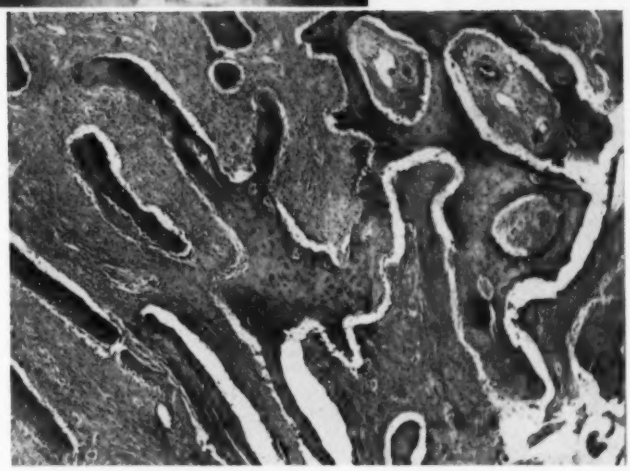


Fig. 6.—Case 5. Above left: Patient at time he first presented himself. Note facial asymmetry. Above right: Roentgenogram of maxilla showing diffuse radiopacity of part of bone illustrated. Left: Anteroposterior view of upper part of facial skeleton. Note obliteration and radiopacity involving the maxillary, ethmoid and frontal sinuses

Fig. 7.—Case 5. Roentgenogram showing thickening and increased radiopacity at anterior part of base of skull



Right: Photomicrograph of part of tissue slide prepared from biopsy specimen. Note fibrous stroma and thick osseous trabeculae interwoven with it which are composed of rather mature lamellar bone

tissue about 1.5 cm. in diameter was removed for study from the cuspid fossa. Histologic examination showed that this tissue was composed of numerous irregular trabeculae of osseous tissue set in a fibrous substratum. The osseous trabeculae had an abnormal number of cement lines (Fig. 7, below). The large number and high maturity of the trabeculae were reflected in the radiopacity of the lesional region.

Nothing further was done in this case, and the patient was dismissed with the assurance that no untoward complications were likely to result. His condition was checked on periodically for three years, during which time there was no change from the clinical picture he presented when first seen.

Fig. 8.—Left: Woman, 22 years old, with swelling of left mandibular region which was associated with progressive difficulty in relation to temporomandibular joint

Right: Showing gigantic enlargement of ascending ramus and coronoid and condyloid process of mandible. Ankylosis of temporomandibular joint was present on that side

■ *Treatment*

As is apparent from the representative cases cited, and from the seven additional cases on which this report is based, radical surgery is not called for in most cases of fibrous dysplasia involving jaw bones. Indeed, massive resections are contradindicated. As a rule, surgical intervention can be limited to an attempt to pare down the bulged region for the sake of a cosmetic effect. Surgery frequently is not indicated even to this extent. No cases have been recorded in which fibrodysplastic lesions of jaw bones have undergone malignant transformation.

In the final analysis, however, surgical treatment is determined by individual special problems. Thus, for

instance, the growth may encroach on the temporomandibular joint so that the joint has become partly or completely ankylosed. A case of this kind is illustrated in Figure 8. The patient was a woman 22 years of age whose difficulty with regard to function of the jaw had increased progressively through several years, until about three years previously, the present stage of complete ankylosis of the temporomandibular joint developed. As can be seen, there was gigantic enlargement of the ascending ramus and of the coronoid and condyloid processes. In another case, that of a man 38 years of age, there was a lesional enlargement involving the neck and a portion of the condyle, but in this case the ankylosis was only partial. In cases of this nature, surgical removal of the lesional region which interferes with articular function is clearly indicated. Furthermore, in some instances in which the condition is associated with the loss of teeth, it becomes necessary to reduce the excessive osseous tissue in order to secure a smooth basic ridge outline adapted for a necessary dental prosthesis.

■ *Summary and Conclusions*

This report is based on a study of 12 cases of fibrous dysplasia involving one or another jaw bone. In one of the five representative cases described, the neighboring cranial bones were also affected. Fibrous (fibro-osseous) dysplasia expresses itself, on the whole, in the same way in jaw bones as it does in the skeleton in general. Fibrodysplastic lesions are more likely to be found heavily ossified in jaw bones, however, than in other skeletal parts.

Fibrous dysplasia of jaw bones corresponds to the lesion which previously has been, and still often is, denoted by such names as "fibrous osteoma," "ossifying fibroma" and "osteofibroma" of jaw bones. Since long-bone lesions (even solitary ones) whose pathology is identical with that of the jaw-bone lesions which have been described under these names are now put into the category of fibrous dysplasia of bone, it seems appropriate to put the jaw-bone lesions into that category also.

The fibrodysplastic lesions of jaw bones are benign lesions, and usually do not grow much after they have come to clinical attention. Radical surgical resections are contraindicated for them. At most, only that surgery should be done which is desirable for cosmetic purposes, or may be necessary to form a smooth base for a prosthesis or to correct a disturbance of temporomandibular function.

■ Written Learning

Books are faithful repositories, which may be awhile neglected or forgotten, but when they are opened again, will again impart their instruction. Memory, once interrupted, is not to be recalled; written learning is a fixed luminary, which, after the cloud that had hidden it has passed, is again bright in its proper station. Tradition is but a meteor, which, if it once falls, cannot be rekindled.—*Johnson.*

Terramycin in the treatment of cellulitis of the floor of the mouth

■ *Stanley L. Lane, M.D., D.D.S.; Leonard Sarvela, D.D.S.; Ian Hu, D.D.S.; Boaz Shattan, D.D.S.; Robin Rankow, D.D.S., M.D., and Austin H. Kutscher, D.D.S., New York*

This paper reports the successful treatment with terramycin hydrochloride of four severe cases of cellulitis of the floor of the mouth (impending Ludwig's angina) which had resulted from infections of dental origin. Three cases were treated with considerable success by intravenous administration of terramycin. In a fourth case, an apparent antagonistic action between procaine penicillin and orally administered terramycin was noted although the patient had previously benefited by combined terramycin-procaine penicillin therapy. This case, we believe, is the first reported instance of such antagonism in the chemotherapy of oral infection and illustrates the practical importance of previously advanced theories based on *in vitro* studies.[1-3]

Abbreviated reports of the individual cases follow.

■ *Case 1*

A 29 year old woman came to the clinic for treatment on March 11, 1952. Acute cellulitis of the floor of the mouth had developed after the extraction of the lower left third molar on March 3. The swelling involved the entire inframandibular region. The lower left third molar region had been incised and drained previously. Penicillin, 600,000 units, had been administered daily since March 7 without benefit. There was no respiratory embarrassment. Moderate dysphagia was present. The blood examination revealed the following: hemoglobin 14.3 Gm. per 100 cc.; white blood cells, 8,500; polymorphonuclear leukocytes, 81 per cent; lymphocytes, 16 per cent; monocytes, 3 per cent. Aerobic *Streptococcus viridans* and staphylococci were found in a culture taken from the tooth socket, while anaerobic plates showed fusiformlike bacilli. Beginning March 12, 100 mg. of terramycin in a 500 cc. isotonic saline solution was administered intravenously twice daily for three days. By March 14 the patient was much more comfortable. The swelling was reduced and there was considerably less trismus and dysphagia. The intravenously administered terramycin was replaced by orally administered terramycin, 500 mg.

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Terramycin for this study was supplied by Charles Pfizer & Company.

From the divisions of oral surgery, surgical pathology, and research (Hannah and Harry Posner Research Laboratory), School of Dental and Oral Surgery of the Faculty of Medicine, Columbia University.

1. Lankford, C. E., and Lacy, H. In vitro response of staphylococcus to aureomycin, streptomycin, and penicillin. Texas Rep. Biol. & Med. 7:111 (Spring) 1949.

2. Spicer, S. Bacteriologic studies of the newer antibiotics: effect of combined drugs on microorganisms. J. Lab. & Clin. Med. 36:183 (Aug.) 1950.

3. Jawetz, E.; Gunnison, J. B., and Coleman, V. R. The combined action of penicillin with streptomycin or chloromycetin on enterococci in vitro. Science 111:254 (March) 1950.

being given every six hours for three additional days. By March 17, the blood count was normal, temperature was normal and complete resolution of the cervical swelling was evident.

■ *Case 2*

An 11 year old boy, in acute distress, was seen on March 17, 1952. There was evidence of cellulitis of the floor of the mouth. No treatment had been given previously. There was a diffuse swelling over the angle of the left side of the jaw of five days' duration. The infection was secondary to advanced caries of the lower left first molar. The boy's neck could be turned only slowly. The patient obviously was toxic and dehydrated and was having difficulty in deglutition. Terramycin, 500 mg. in a 500 cc. solution, was administered by intravenous infusion. By March 18 the swelling was reduced and it was possible to administer terramycin orally, 250 mg. every six hours, for the next four days. The infected tooth was then removed under general anesthesia. By March 24 the swelling had subsided considerably but some induration was still present. The temperature was normal. By March 31 all evidence of infection had disappeared.

■ *Case 3*

On February 3, 1952, a nine year old girl was admitted to the clinic. A huge diffuse submandibular swelling was present. It was red, hot and extremely tender. Her temperature was 102.8°. The progressively increasing infection occurred after the routine extraction of five deciduous and two permanent teeth four days previously. Some limitation of head motion and severe trismus were noted. The tongue was greatly swollen. The child was hoarse and appeared toxic but was without respiratory distress. Procaine penicillin, 1,000,000 units, was administered intramuscularly twice daily. Intravenous administration of 1,500 cc. of dextrose in saline solution was ordered. The white blood cell count was 21,000; polymorphonuclear leukocytes, 92 per cent; lymphocytes, 6 per cent; monocytes, 2 per cent. Alpha and beta hemolytic streptococci were recovered in a culture from her mouth. Terramycin therapy was instituted; 500 mg. was given intravenously every six hours. The succeeding day the patient's condition was much improved and her temperature was 100°. The swelling had decreased, the region was considerably less tender and the trismus was diminished. Terramycin, 500 mg. every eight hours, was administered orally instead of intravenously, and intramuscular administration of procaine penicillin was continued. By February 7 nearly all of the swelling had disappeared. There was no pain and the patient was discharged although terramycin therapy was continued for one additional week.

■ *Case 4*

Two years previously, a 15 year old boy had experienced trauma to the chin. One anterior tooth had been treated by root canal therapy. Sixteen months later, the patient experienced pain and swelling in the lower anterior region of the mandible. All lower incisor teeth were removed. An extraoral incision was made and drainage instituted, after which the infection subsided. Two weeks later swelling developed on the right side of the face.

Table
Dosage regime, Case 4
(Cellulitis of the floor of the mouth)

Date	Procaine penicillin			Terramycin			Results
	Route	Dosage	Duration (days)	Route	Dosage	Duration (days)	
June 10, 1951	—	—	—	Oral	?	2	Satisfactory
Nov. 2, 1951	im.	400,000 U.	8	Oral	500 mg. stat. 250 mg. every 6 hours	8	Satisfactory
Jan. 9, 1952	im.	400,000 U.	25	Oral	500 mg. every 6 hours	2½	No improvemem
Jan. 11, 1952	im.	400,000 U.	4		Discontinued		Dramatic improvement
Jan. 15, 1952	—	Discontinued	—	Oral	500 mg.every 6 hours	3	Continued improvement
Jan. 18, 1952	—	—	—	—	Discontinued	—	Continued improvement
Jan. 23, 1952	—	—	—	—	—	—	Discharged

Terramycin was administered orally and the patient recovered satisfactorily. On November 1, 1951, the patient presented himself in the clinic complaining of pain, trismus, difficulty in swallowing and swelling of the sublingual and right submandibular spaces. This condition had been present for five days. A biopsy of bone from the right retromolar region showed chronic osteomyelitis of the mandible. The white blood cell count was 8,150 (including neutrophils, 75 per cent, and lymphocytes, 24 per cent). On November 2 procaine penicillin and terramycin, orally given, were administered. The exact dosage regimes appear in the table. By November 5 the patient's condition was greatly improved and by November 10 medication was discontinued.

The patient was readmitted on January 9, 1952, because of sublingual swelling and pain. The white blood cell count was 13,950 (including 75 per cent neutrophils and 20 per cent lymphocytes). Intramuscular administration of procaine penicillin and oral administration of terramycin were again instituted. By January 11 no improvement was noted. The terramycin was discontinued. On the morning of January 12 the swelling was noticeably reduced and the dysphagia had disappeared. Favorable progress continued through January 13 and 14. By January 15 the penicillin therapy was discontinued, and oral administration of terramycin was reinstituted. Rapid improvement continued and the terramycin was discontinued on January 18. The patient was discharged on January 23 and no recurrence was noted when he was examined on April 1.

■ *Comment*

The condition of all four patients at the time of their initial appearance was one of an impending Ludwig's angina. Formerly, surgery was performed immediately on such cases. In the instances reported here, although operative intervention was contemplated, surgery was not required after adequate treatment with antibiotics.

Combinations of two or more chemotherapeutic agents frequently have been

administered in the hope of securing additive or synergistic antibacterial effects and also in order to delay the appearance of drug-resistant organisms. There is *in vitro* evidence[1-8] that the opposite, an antagonistic action (between penicillin and the broad spectrum antibiotics), may actually occur sometimes. Jawetz and his associates[3] have shown that under certain conditions terramycin, chloromycetin, aureomycin, and sulfadiazine were antagonistic to penicillin activity. They decreased the early bactericidal action of penicillin *in vitro* and interfered with its therapeutic effectiveness in the treatment of experimental infections in mice. Penicillin did not antagonize the action of the other four antibacterial agents, nor could antagonism be demonstrated if the concentration of the interfering agent was either so high as to be itself strongly active or so low as to be ineffective against the test organism.

Keefer[9] has postulated that penicillin is bactericidal only to those organisms which are in the process of active multiplication. Chloromycetin, aureomycin, and terramycin render microorganisms static (inhibit their growth, but fail to kill). When the latter antibiotics are administered concomitantly with penicillin, the organisms no longer are destroyed by penicillin since the bacteria are not in the susceptible process of active multiplication. He questions, therefore, the use of combinations of chloromycetin, aureomycin, or terramycin (bacteriostatic antibiotics) with penicillin (a bactericidal antibiotic) for synergistic purposes on the basis of presently available information.

It should be noted that in Case 4 the patient improved during the first episode with terramycin therapy alone. Also, procaine penicillin and terramycin combined therapy was successful in treating the second episode. During the third episode, which is reported with particular emphasis in this paper, the patient (1) failed to respond to combined penicillin-terramycin therapy; (2) responded dramatically as soon as terramycin therapy was eliminated from the combined medication, and (3) maintained his rapid recovery when penicillin was discontinued and terramycin was substituted in its place. Therefore, this case may represent an antagonistic action of a broad spectrum antibiotic against penicillin. The antagonism between terramycin and procaine penicillin was seemingly a mutual one, a feature of antibiotic antagonism which Lepper and Dowling[10] have suggested in their clinical report.

Our investigation was highlighted by the exceedingly favorable results of intravenous terramycin therapy. Use of this route of administration is indicated especially in situations wherein oral therapy is impossible. Intravenous administration

4. Jawetz, E., and Speck, R. S. Joint action of penicillin with chloramphenicol on an experimental streptococcal infection of mice. Proc. Soc. Exper. Biol. & Med. 74:93 (May) 1950.

5. Gunnison, J. B.; Coleman, V. R., and Jawetz, E. Interference of aureomycin and of terramycin with action of penicillin in vitro. Proc. Soc. Exper. Biol. & Med. 75:549 (Nov.) 1950.

6. Jawetz, E., and others. Studies on antibiotic synergism and antagonism: the interference of chloramphenicol with action of penicillin. Arch. Int. Med. 87:349 (March) 1951.

7. Gunnison, J. B., and others. Studies on antibiotic synergism and antagonism: the effect of sulfadiazine on the action of penicillin in vitro and in vivo. Antibiotics and Chemotherapy 1:259 (July) 1951.

8. Speck, R. S.; Jawetz, E., and Gunnison, J. B. Studies on antibiotic synergism and antagonism: the interference of aureomycin or terramycin with action of penicillin infections in mice. Arch. Int. Med. 88:168 (Aug.) 1951.

9. Keefer, C. S. Evaluation of antibiotic therapy. Postgrad. Med. 9:101 (Feb.) 1951.

10. Lepper, M. H., and Dowling, H. F. Treatment of pneumococcic meningitis with penicillin compared with penicillin plus aureomycin, studies including observations on an apparent antagonism between penicillin and aureomycin. Arch. Int. Med. 88:489 (Oct.) 1951.

of terramycin, which requires hospitalization and is obviously considerably more costly and impractical than oral administration, was found highly efficacious. Resolution of symptoms was complete in six, seven, and four days, respectively. When recovery is sufficient, intravenous use of terramycin can be replaced by orally administered terramycin therapy.

No antagonistic action was observed between penicillin and terramycin in Case 3 when intravenously given terramycin and intramuscularly given procaine penicillin were administered simultaneously in massive doses.

■ *Summary*

Three severe cases of cellulitis of the floor of the mouth (impending Ludwig's angina) of dental origin are reported which were successfully treated by intravenous administration of terramycin hydrochloride.

A fourth case of cellulitis of the floor of the mouth, successfully treated, is reported in which an apparent antagonistic action was noted between intramuscular administration of procaine penicillin and orally given terramycin. The patient responded well to each antibiotic when administered alone.

Methantheline bromide as premedication for oral surgery

■ *Alvin L. Armer, D.D.S., Hollywood, Calif.*

Two of the requirements of a drug used for premedication when thiopental sodium is the anesthetic are prevention of laryngospasm and antisialogogue action. It has been my experience that methantheline bromide (Banthine bromide) meets these requirements more satisfactorily than atropine sulfate. It is equally effective whether given intravenously or orally.

The procedure is to administer 25 mg. intravenously at the time of induction of the thiopental sodium or to give 100 mg. orally one hour prior to surgery. Both methods produce excellent results in the reduction of salivary flow and the prevention of laryngospasm. A profoundly dry field may be observed within five to ten minutes. In addition to this action, methantheline bromide prevents a certain amount of nausea because of its suppression of gastric motility and free acid secretion.

A series of 599 cases was studied where thiopental sodium anesthesia was given in the office prior to surgery. Of these 599 patients, 174 were given 25 mg.

of methantheline bromide intravenously at the time of the induction of the anesthesia and 425 were given 100 mg. of the drug orally five minutes to one hour prior to surgery. Excellent results were observed in all instances.

The following observations were noted:

1. No laryngospasm was encountered.

2. Methantheline bromide produced a dry field, consequently there was less contamination of the wound.

3. Postoperative nausea was slight and there seemed to be little perspiration.

4. Administration was easy.

5. Its action was rapid and profound.

Caution should be used in administering the drug to elderly male patients with prostatic hypertrophy since it may produce varying degrees of urinary retention. Since methantheline bromide suppresses perspiration, its use in extremely hot weather may be contraindicated.—*6331 Hollywood Boulevard.*

Probenecid-penicillin in oral surgery

■ *Jacob Feinman, D.D.S., Staten Island, N. Y.*

Frequently it is necessary to inject penicillin intramuscularly over prolonged periods of time during treatment of the oral cavity. Instances which require such treatment are, among others, acute or chronic suppurative infections involving the soft tissues, routine removal of teeth for patients with rheumatic fever, cases of osteomyelitis and compound fractures of the jaw bones. Customarily such patients are ambulatory, though complete rest may be desirable on occasion. Repeated intramuscular injections become burdensome as well as costly to the patient and they are time-consuming for the surgeon. The difficulties concomitant with the intramuscular administration of penicillin, therefore, have led to a continued search for methods to improve its oral administration.

Heretofore the oral administration of penicillin has not been satisfactory. About five times as much penicillin is required when administered orally in order to obtain blood levels comparable to those obtained when the drug is administered intramuscularly. Attempts to buffer penicillin against the acidity of the stomach have been made. Nevertheless, penicillinase, produced by intestinal organisms apparently destroys all but 20 per cent of the penicillin that reaches the intestinal tract. Furthermore, the 20 per cent of the initial oral dose of penicillin which finally

enters the blood plasma is rapidly excreted by the kidneys.

It has been observed[1] that

> . . . where a normal relationship exists between glomerular filtration and renal plasma flow, about 20% of a given dose of penicillin is filtered at the glomeruli and about 80% is excreted by the renal tubules. Hence, by suppressing the renal tubular excretion of penicillin, a higher and more prolonged blood level could be obtained than by administering the antibiotic alone in a given dosage.

In 1947 several compounds were developed, the most recent of which is probenecid (Benemid), which are believed to inhibit reversibly the renal tubular transport mechanism for the excretion of penicillin. Beyer[1] concludes that this effect is caused by "a substrate compensation" between the penicillin excreted by the tubules and the compound which is "refractory to excretion by that transport mechanism."

Although early experiments[2] proved that benzoic acid *per se* did not increase penicillin plasma concentration, it was later found that probenecid, a benzoic acid derivative, increased plasma concentration. It has been demonstrated that the intramuscular injection of 100,000 units of penicillin plus probenecid yielded the same concentration at two and a half hours as with 500,000 units of penicillin alone. At six hours, the same concentration results from 100,000 units of penicillin plus probenecid as from 1,000,000 units of penicillin alone. Probenecid is relatively nontoxic. Daily doses of 2 Gm. have been administered for as long as nine months without adverse effects. It is being used for prolonged periods of time in the treatment of tuberculosis in conjunction with para-aminosalicylic acid.[3] Because of its profound uricosuric effect, it is used by itself in the treatment of gout.[4] It increases penicillin blood plasma concentration from 2 to 10 times. The administration of probenecid in conjunction with the intramuscular injection of procaine penicillin will double the blood plasma concentration. It is readily absorbed when administered orally as the acid or sodium salt. It is eliminated from the body via the urine.

In August, 1951, a clinical study of probenecid-penicillin, orally administered, was undertaken. Cases were selected which in past experience would require daily intramuscular injections of 300,000 or more units of procaine penicillin. The general procedure was to administer 300,000 to 400,000 units of procaine penicillin intramuscularly in order to obtain a high blood plasma concentration rapidly. In most instances this would effectively reduce elevated temperatures and afford assurance that initial control of infection ensued. Thereafter, the patient was supplied with sufficient tablets of probenecid-penicillin (each tablet containing either 100,000 units penicillin with 0.5 Gm. probenecid or 50,000 units penicillin with 0.5 Gm. probenecid), one tablet to be

1. Beyer, K. H. New concept of competitive inhibition of renal tubular excretion of penicillin. Science 105:94 (Jan. 24) 1947.

2. Boger, W. P., and Baker, R. M. Comparison of effect of caronamide and benzoic acid on penicillin plasma concentrations. Proc. Soc. Exp. Biol. & Med. 66:1 (Oct.) 1947.

3. Boger, W. P., and others. Benemid, its influences on PAS, penicillin and other antibiotics. Scientific exhibit, annual session of the American Medical Association, Atlantic City, N. J., June 11-15, 1951.

4. Gutman, A. B., and Yu, T. F. Use of Benemid as a uricosuric agent in chronic gout. Presented before the meeting of the Association of American Physicians, Atlantic City, N. J., May 2, 1951.

taken every six hours until the next visit to the office.

One thousand doses of the 100,000 units of penicillin with 0.5 Gm. of probenecid, and another 1,000 doses of 50,000 units of penicillin-probenecid were dispensed to 150 patients. The patients ranged in age from 8 to 84 years and were about equally divided as to sex. In 11 patients with a history of rheumatic fever, where removal of teeth was necessary, the procedure was to inject 300,000 units of procaine penicillin intramuscularly on the day preceding operation, another similar injection the following day a half hour prior to the operation, and thereafter, eight tablets of probenecid-penicillin were dispensed, one to be taken every six hours. Penicillin was administered intramuscularly the day preceding surgery to four patients with a history of rheumatic fever. This was followed by eight doses of probenecid-penicillin to be taken one every six hours. In all instances, healing was uneventful and free from cardiac complications. With six patients who had fractures of the jaw where it was considered best to retain teeth in the line of fracture, the procedure was to administer penicillin intramuscularly on the day of reduction and continue thereafter with probenecid-penicillin tablets, one every six hours, daily, until such time as sufficient callus formation was laid down to permit the safe removal of the teeth in question without danger of displacement of the parts. This required three to six weeks in five instances and four months in one instance. The remaining cases treated involved acute or chronic suppurative infections such as abscesses, cysts, impactions, or removal of teeth in particularly septic mouths.

Comparison of the above series of cases treated with orally administered probenecid-penicillin with similar cases treated with intramuscularly administered procaine penicillin indicates no appreciable difference as to outcome or duration. More convincing evidence along this line is about to be published.[5]

No complications were observed in this series of cases with the exception of a skin eruption in one instance which we believed to be due to sensitivity to penicillin.

Until such time as dosages for orally administered probenecid are firmly established so as to assure constant and adequate blood plasma penicillin concentration, it should be used conservatively as a supplement to the initial intramuscular injection of the antibiotic.

Present advantages of the oral administration of penicillin with probenecid over the administration of penicillin intramuscularly are:

1. It is less burdensome and less costly to the patient.

2. Greater plasma concentrations can be attained with smaller quantities of the antibiotic.

3. Attained therapeutic plasma concentrations can be retained for longer periods of time.

4. Fewer visits to the office are required, thus assuring more complete rest for the patient.—25 *Forest Avenue.*

5. Boger, W. P. Personal communication, May 16, 1952.

The dentist and the explosion hazard

■ *Edward J. Driscoll, D.D.S., Washington, D. C.*

Current dental periodical literature in anesthesiology has been concerned chiefly with the art and science of general anesthesia. Operating room accidents from fire and explosion while using combustible anesthetic gases have not been brought to the dental profession's attention sufficiently.

Accidents arising from the use of explosive gases occur in approximately one out of every 100,000 general anesthesias.[1] It is not surprising that such accidents occur because almost all of the anesthetic gases are explosive and there is a lack of knowledge on the part of operating room personnel, both professional and nonprofessional, of the potential hazards connected with the use of anesthetic gases. Lack of interest in and information on the necessity and importance of mandatory safeguards on the part of many hospital administrators also has been reported.[1]

The necessary prerequisites for an anesthetic explosion[2] are:

1. The use of flammable liquids or gases in sufficient quantities and in an explosive mixture with free air, pure oxygen, or oxygen from nitrous oxide. (The commonly used explosive gases are cyclopropane, ethylene, vinyl ether, ethyl ether and ethyl chloride).

2. A source of heat sufficient to raise the liquid to its flash point or the gas to its ignition temperature.

Explosions are of two general types:

Internal—when they occur within the closed system of the anesthetic apparatus, which includes the patient's respiratory system.

External—when they occur in the immediate vicinity of the operation, but not within the anesthesia system.

Frequently, explosions are a combination of the two types, and actually the difference between them is academic rather than real. Internal explosions which occur within or spread to the patient cause severe burns of the nasopharynx and tracheobronchial tree and frequently rupture the pulmonary alveoli terminating in severe uncontrollable hemorrhage. Such accidents almost always are fatal to the patient. External explosions behave like any conventional explosions and result in injuries and sometimes death to the patient as well as the surgical team and other operating room personnel. In addition to burns, the harm from external explosions is from flying glass and pieces of broken apparatus.

■ *Responsibility*

Because of the nature of anesthetic explosions, legal action is the rule rather than the exception. Regardless of the out-

Senior dental surgeon, assistant chief, Division of Dental Resources, U.S. Public Health Service.

1. Thomas, G. J. Explosion hazards in operating and delivery rooms. J. Am. A. Nurse Anes. 18:26 (Feb.) 1950.

2. Low, W. A. Fires and explosions connected with anesthesia. Proc. Roy. Soc. Med. 44:219 (March) 1951.

come, legal actions are tedious and undesirable, especially since most of the accidents are preventable. The majority of general anesthetics are given in hospitals by trained anesthetists, and many surgeons believe that the responsibility is thereby delegated to the hospital or to the anesthetist. While it is true that the hospital shares responsibility, the prime responsibility under the legal doctrine "respondeat superior" is borne by the surgeon. Moral responsibility in contradistinction to legal responsibility cannot be delegated, and the surgeon is responsible for any negligence, lack of attention or diligence which might result in injury to the patient in any part of the entire surgical procedure. The following language from an actual court case involving an injury sustained under a general anesthetic is typical of court action in these cases.[3]

> In this case skill and diligence must be considered as indissolubly associated. The professional man, no matter how skillful, who leaves an essential link wanting or danger unguarded in the continuous chain of treatment is guilty of negligence, and if the omission results in injury to the patient, the practitioner is answerable.

Even though explosive hazards principally concern hospital practice, the general practitioner who uses vinyl ether (Vinethene), ethyl ether, ethyl chloride, or any flammable disinfectant or medication, should be conversant with the inherent dangers and the steps that can be taken to prevent accidents.

■ *Nature of the Hazard*

A study of 230 cases of fires and explosions reported by B. A. Greene[4] bears out the point that the "Achilles' heel" in the procedure is the ignition mechanism. It was shown that 93 per cent of the accidents can be traced to injudicious use of, or a defect in the electrical equipment or to static electricity, operating as the source of ignition (see table).

Table
Greene study of 230 cases of fires and explosions

Cause	Cases	Per cent
X-ray apparatus	10	4.35
Cautery	57	24.80
Diathermy	20	8.70
Suction and pressure machines	59	25.62
Endoscopic apparatus	5	2.17
High pressure explosion	10	4.35
Static electricity	63	27.40
Miscellaneous	6	2.61
	230	100.00

■ *Source of Ignition*

The source of ignition then looms as the most significant factor in explosion prevention. The sources may be conveniently divided into nonelectrical and electrical causative factors.[2] The nonelectrical sources are more obvious and consequently are guarded against most diligently. They include smoking, the use of matches, alcohol lamps and gas burners. As might be expected, these obvious sources cause very few accidents in the operating room.[4] Since dentists frequently use ethyl and vinyl ether (Vinethene) as well as ethyl chloride in office practice, both for topical anesthesia and for analgesia, together with

3. Bogardus, R. W. Jurisprudence for the dentist. Fort Wayne, Ind., R. W. Bogardus, 1947, p. 48.

4. Greene, B. A. Hazards of fire and explosion in anesthesia. A report of 230 cases. Anesthesiology 2:144 (March) 1941.

potentially hazardous equipment (foot rheostat, motors, electric cautery, unit gas burner, suction machine or hot air syringe), their possible, although not probable, danger must be appreciated. It is true that they are used for only a short time, but the chance of a possible accident still exists. Another potential danger spot is the oral surgeon's private operating suite which generally is not subjected to the routine hospital type of inspection. Its only safeguards, therefore, depend on the oral surgeon's knowledge, diligence and awareness of possible danger.

The electrical sources are the more subtle and are not as easily guarded against; hence they are responsible for the majority (93 per cent) of accidents.[4] These sources are further subdivided into those of power electricity and those of static electricity.

POWER ELECTRICITY—Included under power electricity are all machines, apparatus, lights and equipment which are operated electrically. Hazards may exist from the use of either heat or light producing apparatus or from the use of any electrical apparatus which has not been especially constructed, designed and certified as being safe for use in hazardous locations. In this connection, dentists are warned of the danger of bringing their own electrical instruments into the operating room unless previously presented to the hospital engineering department (or equivalent) for safety certification. An instrument which bears an Underwriters' Laboratory Seal for use in a dental operatory is not necessarily safe for use in hazardous anesthetic locations, unless it has approval for this specified use.[5] Since the latest code defines the hazardous location in an anesthetizing area as extending five feet above the floor, it follows that all instruments used within the five-foot limit have to be given special attention.[6] Included under this regulation are all special dental electrical instruments located in or brought into the operating room.

Rigid codes have been set up for the installation of electrical wiring and equipment and they should be given careful consideration not only in new institutions, but also in the alteration of existing facilities. Constant vigilance and attention is necessary in the maintenance of the system to see that it is kept within the limits of its original safety construction. Plugs and receptacles must be either of explosion-proof design or be located in the above five-foot safety level. Any extension cords necessarily must be of special construction. Lack of attention to extension cord detail is a commonly reported practice in otherwise safety regulated areas.

The electrical system itself should be of the ungrounded type which provides protection against spark hazards in the normal operation of equipment and from spark and electric shock hazard due to insulation failures.[7] The system, in addition to the usual control and protective devices, also can be provided with a ground-contact indicator which will show green when all is well and red (with an

5. Gwin, H. D. Underwriters' Laboratories protect hospitals, patients. South. Hosp. 13:39, 72 (July) 1945.

6. National Fire Prevention Association. Recommended safe practice for hospital operating rooms. N.F.P.A. 56. Boston, National Fire Prevention Association, 1952, Part II, sec. 2-2 (b), p. 7.

7. National Fire Prevention Association. Recommended safe practice for hospital operating rooms. N.F.P.A. 56. Boston, National Fire Prevention Association, 1952, sec. 5-1 (b). p. 11.

audible signal) when any insulation failure occurs, either in the line or in the operating equipment.[8]

STATIC ELECTRICITY—Static electricity is important both from a practical and from an academic standpoint. Preventive measures can eliminate the danger to a great extent if the subject is understood and control measures are adopted. Since almost one third of the accidents are related to static electricity, the importance of this phase of the subject is readily understandable.[4]

The outer layers of electrons which surround all atomic matter are detached easily, and it is these electrons which manifest themselves in the phenomenon known as static electricity.[9] Contact or friction causes the detachment of electrons. The charges collect in particles or bundles on the external surface of nonconductors, like rubber, glass, stone, plastics or textiles. Positive and negative charges of electricity produced and kept apart by nonconductors are virtually at rest, hence the term "static."

The principal danger from static electricity lies in the fact that, although developed on nonconductors, it can be stored on conductors which are insulated. Examples of insulated conductors are the surgeon wearing conventional rubber-soled shoes or the operating table and the anesthetist's stool and machine when they are ungrounded. Static electric charges produced and stored on insulated conductors can discharge through the air when a considerable difference in potential exists and when they are brought into sufficiently close proximity. The spark may not be sufficiently large to be seen or felt but may contain enough thermal energy to ignite or explode an anesthetic mixture.

Prevention of explosions caused by static electricity may be accomplished by: (1) Banning the use in the operating room of materials (nonconductors) which produce static electricity, and (2) providing a means for the rapid discharge of the static particles which are normally produced and stored despite precautions.

If it were possible to ban all nonconductors, the problem would be simple. Since this is not possible from a practical standpoint, the principal offenders must be eliminated. The especially potent generators of static electricity are wool, silk, nylon, rayon, plastic and other synthetic materials, and nonconductive (ordinary) rubber. Objects made of or covered with these materials should be eliminated from the operating room. Undergarments of nonconductive materials are not considered dangerous.[9]

After having provided for the elimination of the major source of electrostatic production, the next precaution is the provision for the safe discharge of static electricity which is incidentally, inadvertently or accidentally produced.

INTERCOUPLING — Intercoupling, which is a mechanical system of conducting attachments between the anesthetist, the patient, the table and the anesthetic apparatus and which provides for a balance of electrical potential, is a widely used means of preventing the accumulation of

8. National Fire Prevention Association. Recommended safe practice for hospital operating rooms. N.P.F.A. 56. Boston, National Fire Prevention Association, 1952, *sec.* 5-5 (c), p. 13.

9. Guest, P. G.; Sikora, V. W., and Lewis, Bernard. Static electricity in hospital operating suites. Direct and related hazards and pertinent remedies. Washington, D. C., Bureau of Mines, U.S. Department of Interior, January, 1952.

static electricity of dangerous potency. Intercoupling may be justified only as a temporary expedient or where, for financial or other reasons, safer methods cannot be employed. Intercoupling is not recommended as a routine measure because of the difficulty and uncertainty of maintenance, because of the tripping hazard and because, even when properly maintained, there remains the possibility of static discharge to the intercoupler system from persons and things not connected to it.[10] Intercoupling also tends to give a sense of security which is unjustified and dangerous.

CONDUCTIVE FLOORS—In order to insure the neutralization of all charges, conductive paths must be provided where charges may be neutralized. The fact that everything of static producing capacity lies on or touches the operating room floor has made possible the employment of conductive floors. These floors are specially constructed of conductive materials or of ordinary materials such as cement and terrazzo into which highly conductive metallic particles or other conductive substances (acetylene black) have been incorporated or employed in a special manner to achieve the purpose. Such floors constantly and continuously permit the neutralization or grounding out of developing charges, or a combination of neutralization and grounding out.

SHOCK HAZARD—In correcting one evil by the use of conductive flooring, another evil, the shock hazard, is created. Since a conductive floor increases the danger to personnel of power electric shock from faulty or grounded electrical apparatus, it is necessary, therefore, to provide a flooring which is conductive enough to allow static dissemination and which still will not be too conductive thereby creating a shock hazard.

The technical difficulties involved in relative hardness, wear resistance, manufacturing and installation of conductive floors have been solved. Many low cost, safe, practical conductive floorings have been developed, a typical example of which is fully described in a recent publication.[11] Such floors are the only practical and reliable means of electro-static control.

Everything and everybody in the operating room must be in satisfactory electrical contact with the conductive floor, which acts as a large intercoupler (Fig. 1). For personnel, suitable contact with the floor is accomplished by the use of conductive rubber shoes (Fig. 2). If special shoes are unavailable, leg attachments[12] of various kinds and designs are manufactured for the purpose and may be worn with conventional shoes. Ordinary rubber-soled shoes should not be worn. Regular leather-soled shoes, because of their uncertain conductive quality, should not be worn without leg attachments unless their conductivity is tested each operating day, a procedure employed in a few hospitals.

HUMIDIFICATION—Another method of static control is by humidification. Con-

10. National Fire Prevention Association. Recommended safe practice for hospital operating rooms. N.F.P.A. 56. Boston, National Fire Prevention Association, 1952, sec. 6-8 (a) (intercoupling-mechanical), p. 20.

11. Griffin, N. L., and Daniel, C. E. Low cost conductive flooring for hospitals. Construction Specifier, July, 1949.

12. No Stat. A static drainage device which is worn on the leg with any type of shoe. There are many such devices provided by different manufacturers.

trary to popular opinion, the addition of moisture to the air does not make it more conductive. The electrical leakage property of most substances and materials within the humid atmosphere is favorably altered because of the absorption of moisture from the air. The relative humidity must be 60 per cent or more to effectively reduce static potential to the nonhazardous level.[9] To obtain high relative humidity, many technical difficulties arise such as fogging and condensation which necessitate expensive

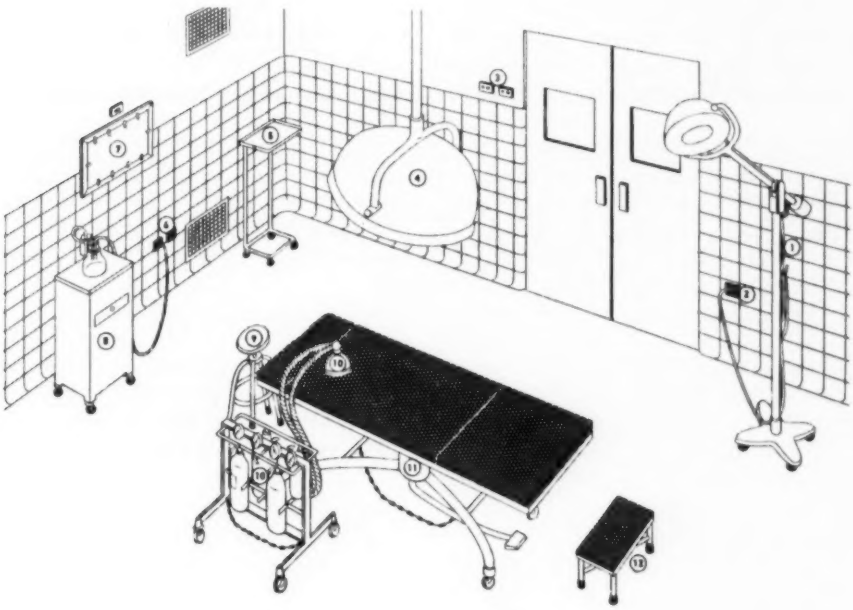

Fig. 1—Operating rooms under the new standards will include the following devices (tiling indicates the five-foot safety level). (1) Portable surgical lamp—grounded through conductive rubber casters. (2) Explosion-proof outlet—below the five-foot level. (3) Push-button switches—need not be explosion proof since they are above five-foot level. (4) Ceiling-hung operating room light—explosion-proof construction is no longer required except for outlets or switches incorporated in'o the construction. (5) Instrument stand—grounded through conductive-rubber casters. (6) Pair of explosion-proof outlets. (7) Recessed roentgenogram viewing window with electrical connections outside of operating room; toggle switch to operate is above the five-foot level and need not be explosion proof. (8) Suction apparatus—grounded by conductive rubber casters; motor within the cabinet must be explosion proof. (9) Anesthetist's stool—grounded through conductive rubber tips; seat must be unpainted, and if a pad is used it must be covered with conductive rubber. (10) Anesthesia apparatus—mask and hose of conductive rubber; this unit is grounded by a drag chain but the same purpose would be met if casters were of conductive rubber. (11) Operating table—the pad is of conductive rubber; table is grounded to floor by a drag chain. (12) Surgeon's metal footstool—has conductive rubber tips, and padding, if used, must be of conductive rubber. The floor must be constructed of conductive materials. N. B. June 1952, N.F.P.A. regulations governing safe practice in hospital operating room no longer approve drag chains. (Courtesy of Hospitals)

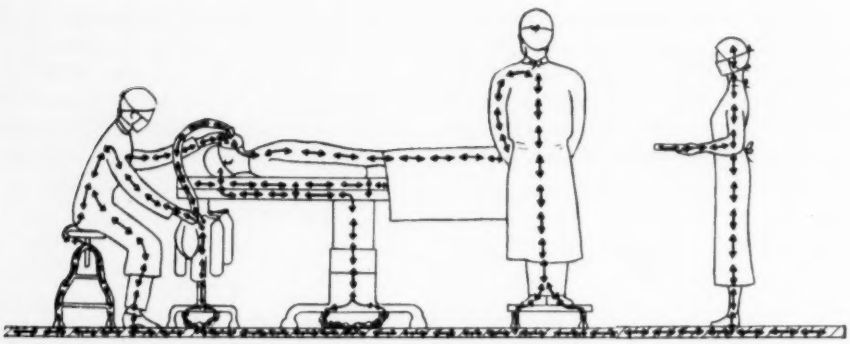

Fig. 2—Arrows (below and right) show the two-way flow of electric charges generated in operating rooms. Conductive floor is common connector. Anesthetist is grounded in four ways: (1) Through the anesthesia apparatus; (2) through the patient; (3) through his stool, and (4) through conductive shoe soles. Anesthesia apparatus and operating table are grounded by drag chains. Patient is grounded through both of these—through the connecting links of conductive rubber tubing of apparatus and conductive rubber pad of table. The surgeon wears conductive shoes and stands on grounded footstool. Nurse is grounded through conductive shoes. N.B. June, 1952, N.F.P.A. regulations governing safe practice in hospital operating room no longer approve drag chains. (Courtesy of Hospitals)

and extensive wall and window insulation. In the light of present knowledge, other methods of static control are more reliable and less expensive.

Good ventilation and air conditioning provide a zone of comfort. In addition, minimal humidification consistent with air conditioning operation will assist in the over-all control of static electricity by increasing the conductivity of materials such as cotton which cannot be excluded from the list of essential operating room materials.

■ *Recommendations*

The recommended preventive procedures may be remembered easily by Buckle's[13] descriptive "Triple E"—engineering, education and enforcement.

ENGINEERING—It is the hospital administrator's responsibility to buy approved safety equipment and to alter or build new facilities to meet all the specifications of the National Fire Protection Association's National Electrical Code and its other pertinent published regulations. The influence exerted by hospitals in regard to engineering is exemplified in the following estimate for mid-1951.[14]

1. Thirty-one per cent of the major and minor operating rooms in the country will be re-floored.

2. More than 33⅓ per cent of the anesthesia machines will be refitted or replaced.

3. Thirty per cent of the hospitals will buy static detectors even though they are not mandatory under the code.

13. Buckles, M. G. Anesthetic explosions. J. Thoracic Surg. 21:426 (April) 1951.

14. Johnson, B. I. Buying safety against operating room explosion hazards. Hospitals 24:87 (Dec.) 1950.

4. Thirty-six per cent of the hospitals will buy or share in the expense of conductive shoes or other grounding apparatus which are needed for an estimated 145,000 personnel.

EDUCATION—The most important phase in the prevention scheme is the proper education of all personnel, especially the anesthetist, operating room personnel and hospital superintendents.[4] Knowledge of the nature of the hazard will give meaning to safeguards and will motivate the individual to give attention to the necessary detail.

ENFORCEMENT—A lack of attention to administrative details of a safety code, rather than inadequacies of the physical plant, has been blamed for a large number of reported accidents.[15]

■ *Summary*

Specific recommendations for the prevention of explosion hazards are:

1. The general physical and chemical properties of the gases and their relative explosive properties should be understood and appreciated. Special instruction and periodic attention to the problem is needed for continual alertness.

2. The substitution of safe anesthetic agents for the dangerous gases where explosion-producing appliances such as the cautery, diathermy and x-ray equipment must be used. When such electrical equipment is employed, and the substitution of a safe anesthetic is not possible, extraordinary precautions should be used only with the full knowledge of the dangers involved.

3. The electrical system should be constructed so as to conform with the National Electrical Code and should be inspected regularly.

4. The static hazard must be understood and the static-producing materials such as wool, rubber, silk, nylon, plastic, and so forth should be excluded or substituted for whenever possible.

5. The use of conductive floors or suitable substitutes should be mandatory.

6. All furniture and equipment should be constructed of metal or other conductive material.[16] Surfaces on which movable objects may be placed should be without lacquer or other insulating finish. Casters, tires, or leg tips shall be of unpainted metal or conductive rubber, with a floor contact surface having one dimension of at least ⅝ inch. (Drag chains which were previously conditionally approved, are not accepted in the June, 1952, standards of the N.F.P.A.)

If all the available and known preventive measures were employed, anesthetic explosions would be extremely rare, and the emotional and legal complications resulting from such accidents would be practically eliminated.

15. Buck, G. H. Control of anesthesia hazards. Mod. Hosp. 70:63 (Feb.) 1948.

16. National Fire Preventive Association. Recommended safe practice for hospital operating rooms. N.F.P.A. 56. Boston, National Fire Prevention Association, 1952, sec. 6-3 (a), p. 19.

Oral manifestations of infection with the virus of herpes simplex

■ *James L. Scales, D.D.S., Tuskegee, Ala.*

The virus of herpes simplex is one of the most common infectious agents of man.[1] Cahn and Bartels[2] summarized their findings concerning oral lesions caused by the herpes simplex virus as follows:

> It is thus apparent from the results of various studies that the conditions called aphthous ulcer (canker sore), herpes labialis, aphthous stomatitis, herpetic stomatitis, or acute infectious gingivostomatitis are infections caused by the herpes virus, since:
>
> 1. The virus present in aphthous lesions, when inoculated on the scarified cornea of rabbits, produces lesions identical with those caused by the herpes simplex virus.
> 2. Encephalitis is induced in a definite number of animals subsequent to inoculation with the virus from either herpes or aphthous lesions.
> 3. Lipschütz intranuclear acidophilic inclusion bodies have been demonstrated in the cells of the injected cornea and the brains of animals inoculated with the virus of herpes or the virus present in aphthous stomatitis.
> 4. Rabbits inoculated with the virus present in aphthous stomatitis are rendered immune toward the herpes virus.
> 5. The herpetic antibody develops in the patient's serum during convalescence from either herpes lesions or aphthous stomatitis. The virus remains dormant until some contributory factor lowers the local tissue immunity. Then the herpetic lesion occurs.
>
> In contradistinction to other virus diseases there is no permanent immunity after an initial herpes simplex virus infection. Recurrence is the rule in infections by the herpes simplex virus. The disease is self-limiting, and treatment is aimed at palliation.

For purposes of discussion, the oral lesions caused by herpes simplex virus have been divided into two groups: (1) lesions of the initial infection which consist of the local lesion accompanied by systemic symptoms of varying degrees of severity; for example, aphthous stomatitis, herpetic stomatitis, or acute infectious gingivostomatitis; (2) lesions of the recurrent type which, regardless of their extent, usually are not associated with systemic symptoms, aphthous ulcer (canker sore) and herpes labialis.

■ *Characteristics Common to All Virus Lesions*

All virus lesions occurring in the oral cavity present certain common clinical features and laboratory findings that may aid in their diagnosis.

CLINICAL FEATURES—A subjective feeling of irritation or itching is followed by hyperemia and vesicle formation. The vesicles soon rupture, liberating a clear yellow fluid and leaving a raw painful ulcer surrounded by an erythematous

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Dental staff, dental service, Veterans Administration Hospital.

1. Rivers, T. M. Viral and rickettsial infections of man. Philadelphia, J. B. Lippincott Co., 1948.

2. Cahn, L. R., and Bartels, H. A. Aphthae and herpetic gingivostomatitis. Am. J. Orthodont. & Oral Surg. (Oral Surg. Sect.) 28:140 (March) 1942.

border. The lesion usually heals without scarring.

LABORATORY FINDINGS—The following laboratory findings have been listed by Cahn:[3]

Microscopic examination of tissue may show ballooning and reticular degeneration and the inclusion bodies. The blood count will show leukopenia with a relative lymphocytosis in the early stages of the infection. A blood smear will be similar to one seen in infectious mononucleosis. Saliva or material from the lesion, when rubbed into the scarified cornea of a rabbit, will cause keratosis and occasionally encephalitis. Heterophil antibodies may be present. Specific herpetic neutralizing antibodies may be found in the blood during convalescence. A bacterial smear will reveal no characteristic organisms. The appearance of fusospirochetal organisms may be misleading and confusing.

■ *Acute Herpetic Gingivostomatitis*

Acute herpetic gingivostomatitis is seen in infants and young children mainly, but it may also occur in adults.[4] It is caused by a virulent strain of the herpes simplex virus.

CLINICAL APPEARANCE—Gingivitis is present and the gingival tissues have an inflamed red color, are edematous, and in certain areas may cover the teeth. Tiny vesicles open rapidly to form small shallow ulcerations with a yellow fibrinous exudate. The ulcer is surrounded by a red border. The vesicles and ulcerations are diffusely distributed over the oral mucosa.

There usually is excessive salivation and constant drooling. This saliva and the vesicular fluid contain the virus and represent the means of transmission. The lips may show fissuring from dehydration and constant drooling. The lesions also may occur on the skin at the corners of the mouth.

The breath has an unpleasant odor. The regional lymph nodes draining the area are enlarged and become tender early in the disease. This lymphadenopathy may persist for days after the ulcers heal.

Constitutional symptoms always are present and may be extremely severe. For two or three days preceding the appearance of lesions the child is ill. He usually refuses to eat and may complain of a sore mouth. In infants the temperature may reach extreme heights during the first few days. There is a feeling of general malaise and the patient becomes uncooperative and fretful.

Diagnosis is made on the basis of (1) clinical picture, (2) history of acute onset, (3) characteristic appearance of the early lesion and (4) laboratory studies.

For a differential diagnosis of acute herpetic gingivostomatitis, the following must be remembered:

1. Vincent's stomatitis involves the gingiva, attacking and destroying interdental papilla. Herpetic gingivostomatitis involves primarily the smooth mucosal surfaces, and interdental papillae are involved with the rest of the gingiva.

3. Cahn, L. R. Virus disease of the mouth. Oral Surg., Oral Med. & Oral Path. 3:1172 (Sept.) 1950.

4. Ziskin, D. E., and Holden, M. Acute herpetic gingivostomatitis: report of fifteen cases. J.A.D.A. 30:1697 (Nov. 1) 1943.

2. A large, punched-out, painful ulcer is present in Vincent's stomatitis. In herpetic gingivostomatitis, vesicles are followed by small, shallow, dull yellow lesions which are surrounded by an area of erythema.

3. Smear of lesion in Vincent's stomatitis will show a large predominance of fusospirochetal organisms. A smear of the lesion in herpetic gingivostomatitis shows nothing diagnostic.

4. In thrush, the lesion is painless, elevated and pearly white in color. In herpetic gingivostomatitis, the lesion is painful, depressed and dull yellow in color.

5. The smear in thrush will show *Monilia albicans*. A smear of the lesion in herpetic gingivostomatitis shows nothing characteristic.

6. In dermatologic diseases having oral manifestations, lesions will be found on cutaneous surfaces as well. In herpetic gingivostomatitis the lesions are confined to the oral mucosa.

TREATMENT—The advent of aureomycin has marked a milestone in the therapeutic management of herpetic gingivostomatitis. Aureomycin, in the form of lozenges, gives relief from the painful symptoms. The time of duration of the disease process is shortened but this is not as noticeable as is the disappearance of discomfort. Almost without exception, the patient is able to eat in comfort within 24 hours although lesions may still be present. Jacobs and Jacobs[5] reported two cases of herpetic stomatitis in which one of the patients was able to eat within five hours. Usual dosage consists of dissolving one 15 mg. troche in the mouth four times daily for a period of four or five days.

Supportive therapy consists of good oral hygiene and the daily use of saline irrigations to remove epithelial debris. Sedatives are used to control the discomfort, and hypnotics to produce sleep when necessary. Cold fluids and foods seem to be better tolerated.

There are conflicting reports on the value of thiamine in the treatment of this condition.[6] The dictates of good nutrition during infection and fever, however, warrant the administration of therapeutic daily doses of multivitamins.

Usually, as a result of high temperature and restricted fluid intake, patients show considerable dehydration. If fluid intake cannot be increased easily through the oral route, then hypodermoclysis or infusion should be started.

Penicillin is not efficacious as a therapeutic agent.[5,7] The sulfonamide compounds are of no value in the treatment of herpes simplex.[8] Marsh and Millar,[9] in discussing the problem of viricides, write that they know of no agent at present that is selective enough to destroy virus in oral tissue infections without at the same time injuring the tissue to which it is applied.

As we see no advantage in adding a chemical injury to tissue already injured by the virus

5. Jacobs, H. G., and Jacobs, M. H. Aureomycin: its use in infections of the oral cavity. Oral Surg., Oral Med. & Oral Path. 2:1015 (Aug.) 1949.

6. Burket, L. W., and Hickman, G. C. Oral herpes (simplex) manifestations: treatment with vitamin B complex. J.A.D.A. 29:411 (March) 1942.

7. Northrop, P. M. Penicillin therapy in oral surgery. J. Oral Surg. 7:39 (Jan.) 1949.

8. Spink, W. W. Sulfanilamide and related compounds in general practice, ed. 2. Chicago, Year Book Publishers, Inc., 1943, p. 266.

9. Marsh, T. L., and Millar, I. A. L. Application of antiseptics and antibiotics. J. Canad. D. A. 17:74 (Feb.) 1951.

infection, we prefer to treat these lesions by copious washing to dilute the irritants and administer local and systemic sedatives for the pain.

■ *Solitary Herpetic Lesions*

Not all oral viral lesions occur as a generalized stomatitis. The solitary occurring herpetic ulcer is the form usually seen in the older age group. This lesion has been designated by various authors as aphthous ulcers, canker sore, allergic aphtha and traumatic ulcer. The lesion seen on the lip is known as herpes labialis, cold sore or fever blister. It is the most common lesion of the lip.[10] The present trend is to classify all these lesions as a form of herpetic ulcer. Massler and Schour[11] present such a classification. Cahn[3] seemingly concurs with this type of classification. He offers as an explanation the belief of Burnet that in many instances the initial infection has taken place in early childhood. After the first clinical manifestation of the disease, the virus remains dormant in the cells throughout life to be reactivated from time to time under a varying number of stimuli. Among the stimuli are trauma, endocrine change and allergy. Burket[12] considers as predisposing causes pneumococcal pneumonia, meningitis, common cold, menstruation, pregnancy, thyroid disease, dental operative procedures, use of the rubber dam and focal infection. Everett[13] summarizes the data on exciting causes in the following manner:

> It would appear that these various secondary causes, serving to precipitate the attack in the susceptible, act only as a trigger mechanism to lower the resistance of the host locally, generally, or both locally and generally, at that time. This would explain the variety both of etiologic factors implicated and of treatments recommended for these conditions in the past.

CLINICAL FEATURES—Regardless of the differences in terminology, the solitary herpetic ulcer begins as a central vesicle that ruptures, liberates a serous fluid, and leaves a raw, painful ulcer. The lesion usually occurs in certain areas of the oral epithelium, which have been termed transitional zones by Massler and Schour.[11] These include (1) the dental surface of the free marginal gingivae (transition from epithelial attachment to the attached gingivae); (2) the transition from the attached gingivae to the buccal and lingual oral mucosa; (3) lateral margin of the tongue (transition from dorsal to ventral mucosa of tongue); (4) transitional zone of lip (border between the red portion of the lip and the oral mucosa), and (5) junction of the hard and soft palate.

Diagnosis is based on (1) history of recurrent nature of ulcer as well as acute onset; (2) clinical picture as outlined earlier; (3) laboratory studies.

TREATMENT—Everett[13] performed clinical studies to determine the effectiveness of aureomycin in therapy of herpes simplex labialis and recurrent oral aphthae. He found that prophylactic use of 5 per cent aureomycin ointment reduced the incidence of herpes labialis by more than 75 per cent. The treatment of

10. U. S. Naval Medical School. Color atlas of pathology. Philadelphia, J. B. Lippincott Co., 1950, p. 251.
11. Brauer, J. C. Dentistry for children, ed. 2. Philadelphia, Blakiston Co., 1947, p. 176-197.
12. Burket, L. W. Oral medicine. Philadelphia, J. B. Lippincott Co., 1946, p. 146.
13. Everett, F. G. Aureomycin in the therapy of herpes simplex labialis and recurrent oral aphthae. J.A.D.A. 40:555 (May) 1950.

existing lesions of herpes labialis with aureomycin ointment by the oral administration of 25 aureomycin troches, 15 mg. each, given at two hour intervals over a period of three days resulted in a 39.9 per cent reduction in the length of duration of the lesions of recurrent oral aphthae. The best response to treatment of these conditions was noted when medication started within the first 24 hours after eruption.

Because pain is the chief feature, the treatment is directed toward protecting the free nerve endings just under the superficial ulcer. Perhaps the most popular method is coagulation of the ulcer surface with a cauterizing agent. As pointed out in discussing the treatment of the stomatitides, the use of caustic agents is to be deplored because of their destructive effect on the surrounding normal tissue. The sulfonamides, antibiotics or viricides are of no value.

A preferred treatment of the solitary herpetic ulcer is the use of compound benzoin tincture. The area is dried and the benzoin applied. The alcohol evaporates to leave an adhesive, pliant protective coating. This will not injure the adjacent tissue. The patient can be given a prescription for compound benzoin tincture with directions to apply as needed for the relief of pain.

It must be emphasized that the preceding therapy is only palliative and seldom hastens the healing.

The use of vitamin B complex has been advocated, although the lesion is not a symptom of vitamin B deficiency. The results are inconclusive,[5] however. On the rationale of the "interference phenomenon" explained by Cahn[3] or the "group immunologic relationship"[12] of other investigators, repeated vaccinations with smallpox vaccine[14] or formolized virus[15] have been urged. Savitt and Ayres[16] reported that, in general, attempts to immunize against herpes simplex by the strains of herpes simplex virus have not been successful. Rivers[1] points out that results with vaccination vary greatly.

14. Foster, P. D., and Abshier, A. B. Smallpox vaccine in the treatment of recurrent herpes simplex. Arch. Dermat. & Syph. 36:294 (Aug.) 1937.

15. Frank, S. B. Formolized herpes virus therapy and the neutralizing substance in herpes simplex. J. Invest. Dermat. 1:267 (Aug.) 1938.

16. Savitt, L. E., and Ayres, S., Jr. Persistent multiple herpes-like eruption: response to repeated intradermal injections of smallpox vaccine. Arch. Dermat. & Syph. 59:653 (June) 1949.

■ CLEAR THINKING

Yes, clear thinking is rare. To approach it, we need above all that indispensable quality of the scientific spirit—humility. Like the good scientists, we must be ready to sacrifice some of our personality and habits of thought as we face each new problem. For life's problems are always new, and defy all ready-made solutions.

That's what makes life so interesting.—*Rudolf Flesch, The Art of Clear Thinking.*

Present concept of oral focal infection

■ *William E. Wellman, M.D., Rochester, Minn.*

The theory of focal infection had its origin in the early part of this century, and during the twenties and thirties it was widely accepted. During this period, foci of infection no doubt were unjustly incriminated as the etiologic factor in numerous diseases. In many instances the specific disease and the focus were thought to be related because they occurred simultaneously in the same patient. This erroneous conclusion is not surprising since at that time the precise methods of modern bacteriology were in the early stages of development. The bacteriologic procedures available apparently were not always reliable and often were misleading. These procedures seemed to support the conclusion that if a focus and a disease occurred simultaneously, they must be related. It must be remembered also that at that time dentistry had not yet developed to its present highly specialized form. Without question, roentgenography, aseptic technic and modern restorative procedures have reduced significantly oral foci of infection.

The literature of the twenties and thirties contained numerous articles which dealt with foci of infection. In recent years there has been less interest in this subject, and consequently relatively little has been written. As is often true, the pendulum of thought apparently has swung too far and today there is not enough attention given to foci of infection.

■ *Oral Bacteria*

An extremely varied flora is found in the mouth. The saliva is not a good culture medium but the accumulation of exudates, secretions and food particles beneath the margins of the gingiva affords excellent conditions for bacterial growth. The narrow clefts between the teeth and between the gingiva and the teeth present an ideal breeding place for anaerobic bacteria. The organisms commonly found in the mouth include aerobic and anaerobic streptococci. The streptococci most frequently encountered are those of the viridans group which includes *Streptococcus salvarius* and *Streptococcus mitis*. Staphylococci, pneumococci and meningococci often are isolated from the mouth. Spirilla and spirochetes almost always are present. Fungi and yeasts occasionally are found and the most important of these are the actinomyces. There are, of course, many other organisms which occur less frequently.

■ *Diseases Associated with Oral Infection*

The disease of most significance associated with infection in the mouth is subacute bacterial endocarditis. It has

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Division of medicine, Mayo Clinic.

been demonstrated by several investigators that vigorous massage of the gums often is followed by a transient bacteremia. Organisms have been isolated from the blood stream after paraffin has been chewed or after the extraction of a tooth. Transient bacteremia of this type often can be of great clinical importance. It is well known that many organisms readily attack a previously damaged heart valve. Also, certain organisms may invade the normal heart valve and thus produce subacute bacterial endocarditis. It is not uncommon for subacute bacterial endocarditis to develop after the extraction of a tooth from a patient who has had rheumatic fever. Certainly this is one instance in which a focus of infection in the mouth plays an important part in the production of a serious systemic disease. Great advances have been made, it is true, in the treatment of bacterial endocarditis. It must be remembered, however, that treatment of subacute bacterial endocarditis is long, costly and sometimes unsuccessful. Furthermore, it must be remembered that if a focus of infection is overlooked in the mouth, it may continue to feed the blood stream and thus cause recurrence of subacute bacterial endocarditis.

■ *Prophylactic Therapy*

Subacute bacterial endocarditis has been discussed first because it is of great importance and the dental profession is directly involved in its prevention. Any patient with a heart murmur who undergoes an operation on the mouth should have prophylactic therapy. I have used the general term "heart murmur" since it is often difficult or impossible to distinguish between organic and functional heart murmurs. The risk of subacute bacterial endocarditis is sufficient to warrant prophylactic therapy whenever a heart murmur of any type is present. It is the responsibility of the dentist performing the oral operation to take a brief cardiac history. If the patient gives a history of valvular heart disease of any type, he should be referred to a physician for consideration of prophylactic therapy. Occasionally this will be impossible and the dentist must assume the responsibility for the administration of prophylaxis. If an error is to be made, it should be on the side of safety; prophylaxis should be given whenever there is doubt concerning valvular heart disease.

Procaine penicillin is the drug best suited for prophylactic use of this type. Procaine penicillin G in aqueous suspension, 300,000 units, may be given the day before, the day of oral surgery, and the first postoperative day. The one disadvantage of this drug is that it must be given by injection. Aureomycin and terramycin, which are administered orally, are excellent substitutes. These antibiotics, like penicillin, may be administered for a period of three days. The oral dose of aureomycin and of terramycin is 500 mg., or two capsules, every six hours. The antibiotic, chloramphenicol, should not be used for prophylactic therapy since use of this drug may be followed by fatal aplastic anemia.

It is not uncommon today to encounter a patient who has survived an attack of subacute bacterial endocarditis. These patients should be referred to a physician for complete study and for more intensive prophylactic therapy with one of the antibiotics. Prophylactic therapy is

of great practical importance to all members of the dental profession.

What has been said concerning subacute bacterial endocarditis also applies to bacteremia. Occasionally severe bacteremia follows the extraction of a tooth. Fortunately, this disease is not as serious as subacute bacterial endocarditis since usually it can be controlled quickly by use of one of the antibiotics.

■ *Foci of Infection and Chronic Systemic Diseases*

In general, most physicians and dentists agree that a focus of infection in the mouth or elsewhere in the body is deleterious to general good health. Therefore, whenever possible, these foci should be removed. This is especially true when the patient is suffering from a chronic systemic disease. The relationship between a focus of infection and certain chronic systemic diseases has caused considerable controversy in the past. An example of such a disease is rheumatoid arthritis. In my opinion any obvious focus of infection should be removed. This does not mean that the focus of infection has caused the rheumatoid arthritis. Nevertheless, an obvious focus of infection should be removed just as it should be from an otherwise healthy person. On the other hand, the wholesale removal of teeth on the assumption that focus might be present is to be condemned.

It has been clearly established that occasionally a focus of infection can cause fever. It is not uncommon to find that a so-called fever of undetermined origin will disappear when the offending focus is removed.

The removal of oral foci of infection is of importance in actinomycosis. There can be no question that cervicofacial actinomycosis often develops from a periodontal infection. Penicillin and the newer antibiotics have been extremely effective in the control of this disease. If a focus of infection is present in the mouth, however, it should be removed.

■ *Summary*

In recent years clinical experience and modern bacteriologic technic have limited the application of the theory of focal infection. There are, however, several instances in which foci of infection seem to be associated with systemic disease.

There appears to be a relation between oral foci of infection, subacute bacterial endocarditis and bacteremia. These diseases can be controlled with antibiotic therapy; but, in addition, when a focus of infection is present in the mouth, it should be removed. When operations on the mouth are contemplated, subacute bacterial endocarditis and bacteremia frequently can be prevented by prophylactic antibiotic therapy

When an obvious oral focus of infection occurs in an otherwise healthy person, it should be removed. In a similar manner, obvious foci of infection should be removed from a patient suffering from chronic systemic disease. In the treatment of cervicofacial actinomycosis, a focus of infection in the mouth should be suspected and removed when it is present.

Correction of asymmetric prognathism by unilateral ostectomy

■ *Benjamin J. Jacobs, D.D.S.; S. Stephen Rafel, D.M.D., and Benjamin Weiss, D.D.S., Newark, N. J.*

The history of operations for correction of prognathism dates back over a hundred years. Hullihen[1] in 1848, Blair[2] and later Jaboulai[3] and Dufourmental[4] all performed surgical procedures for the correction of this deformity. Two basic procedures are now utilized in the correction of prognathism, namely, bilateral osteotomy and bilateral ostectomy.

The osteotomy operations have been performed in many ways. A horizontal section may be made across the ascending ramus between the mandibular foramen and the angle of the mandible. The neck of the condyle may be sectioned or the gonial angle cut. A horizontal section through the ascending ramus may be made between the sigmoid notch and the mandibular foramen. The many papers that have been written since the turn of the century have carefully and adequately described these operations, with many variations in technic.[1, 4-14]

Regardless of the surgical procedure used and the ultimate functional and esthetic results obtained, there is no one technic that is not attended by many problems to both the orthodontist and oral surgeon. The fact that there has been no standardization of technic in over a hundred years bears out the foregoing statement.

Some of the problems that may confront the orthodontist and oral surgeon are as follows:

1. Lack of control of the upper or proximal segment because of muscular action, with separation of the fragments and nonunion at the site of osteotomy when performed in the ramus.

1. Hullihen, S. P. A case of elongation of the under jaw and distortion of face and neck, caused by a burn, successfully treated. Am. J.D. Sc., ser. 1, 9:157, 1849.

2. Blair, V. P. Operations on the jaw bone and face. Surg., Gynec, and Obst. 4:67, 1907.

3. Foman, S. The surgery of injury and plastic repair. Baltimore, Williams & Wilkins Co., 1939.

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5. Dingman, R. O. Surgical correction of mandibular prognathism, an improved method. Am. J. Orthodont. (Oral Surg. Sect.) 30:683 (Nov.) 1944.

6. Dingman, R. O. Osteotomy for the correction of mandibular malrelation of developmental origin. J. Oral Surg. 2:239 (July) 1944.

7. Harsha, W. M. Bilateral resection of jaw for prognathism: report of case. Surg., Gynec. & Obst. 15:51 (July) 1912.

8. Hensel, G. C. The surgical correction of mandibular protraction, retraction and fractures of the ascending rami. Int. J. Orthodont. 23:814 (Aug.) 1937.

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12. Scougall, S., and Colvin, Gordon. Functional retention in preangular resection for malocclusion in protrusion of the mandible. Oral Surg., Oral Med. & Oral Path. 4:695 (June) 1951.

13. Skaloud, F. New surgical method for correction of prognathism of the mandible. Oral Surg., Oral Med. & Oral Path. 4:689 (June) 1951.

14. Winter, L.; Winter, R. E., and Winter, L., Jr. Surgical correction of prognathism of the mandible. Oral Surg., Oral Med. & Oral Path. 2:1506 (Dec.) 1949.

2. Anterior open bite due to downward and forward pull of the hyoid group of muscles creating a lever of the first class. This is seen particularly in osteotomy at the angle.

3. Imperfect osseous repair at the site of osteotomy when done on the ascending ramus resulting from thinness of bone and a large amount of cortical structure.

4. Impaired function of joints due to displaced attachments of external pterygoid muscles when operation is performed at condylar necks.

5. Possible injury to the parotid gland, facial nerve and internal maxillary artery, which lies close to the medial surface of the mandible, when performing surgery in the ramus or joints.

6. In operations above the lingula Hensel[8] has shown that separation of the coronoid and condyloid processes may result since there is a safe area of only 3/16 of an inch.

Most often the ostectomy procedure is preferred. A measured section of bone may be removed. The operative site is much more accessible, and reduction and fixation may more effectively be controlled. There is little interference with the muscles; therefore the possibility of open bite relationship, while not completely eliminated, is minimized. Blair,[2] Kazanjian,[9] Padgett[15] and Dingman,[4-6] among others, are protagonists of this technic. There are certain objections, however. Functional teeth as well as healthy bone must be sacrificed at the site of ostectomy. If the operation is performed intraorally, the wound must open into the mouth. Fortunately with the modern use of chemotherapeutic and antibiotic agents this risk is minimized. Heretofore the mandibular nerve and its associated vessels were severed during this operation. Dingman[4] has made a great contribution with his two stage procedure whereby the mandibular nerve and its vessels are kept intact. This procedure consists of an intraoral approach followed about one month later with an extraoral approach.

It has been ascertained that the sliding osteotomy operation of Blair[2] and Hensel[8] can be employed only in those cases in which the extent of mandibular retraction is less than two-thirds the width of the ascending ramus. This is in order to insure proper osseous union and repair. In these procedures one must exercise extreme care in order to avoid injury to the facial nerve and internal maxillary artery.

It might be important to mention that, in those cases in which an open vertical relationship is anticipated after correction, the osseous cut must be made downward and backward. In those cases in which closure of bite is expected, the cut must be made downward and forward. When posterior lower teeth are missing, a splint must be constructed.

■ *The Unilateral Ostectomy*

A study was made of several prognathic cases, including those we had handled in the past. It was noticed that in not all of these cases was the protrusion symmetrical. In many there was an asymmetric protrusion; the median line was greatly off to one side.

Dingman[4] reported that, in some of his cases of severe prognathism, the posterior segment was brought medially as

15. Padgett, E. C. Surgical diseases of the mouth and jaws. Philadelphia, W. B. Saunders Co., 1938.

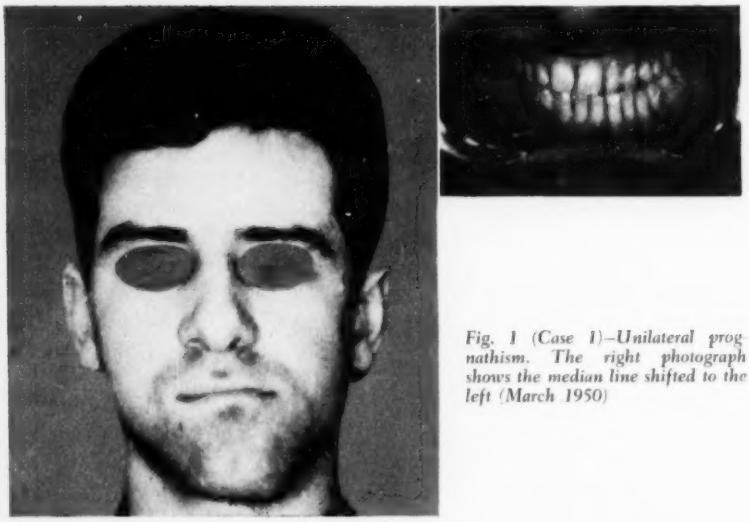


Fig. 1 (Case 1)—Unilateral prognathism. The right photograph shows the median line shifted to the left (March 1950)

much as 10 mm. to meet the anterior segment after operation. He observed no untoward effect at the condyle resulting from its new position.

It occurred to us that, in these cases of asymmetric prognathism, correction might be obtained by unilateral ostectomy, thereby reducing by 50 per cent the hazards of the operative procedure. Trial operations on models were done to ascertain the extent of ostectomy necessary and possible esthetic result.

We have performed three unilateral operations in cases in which the median line was greatly off to one side. In our limited experience with unilateral ostectomies we have found this operation to be successful when indicated. There has been no untoward effect observed from the rotation of one condyle in the glenoid fossa. Wherever possible, we recommend the unilateral procedure in cases of asymmetric protrusion.

CASE 1—(See Fig. 1-3.) A 20 year old man with complaints of facial deformity and malocclusion was seen May 5, 1949. Physical examination revealed the mandible skewed toward the left with the center line off about 1 cm. The patient lisped slightly and appeared to be shy. Models were taken January, 1950; since the deformity appeared to be confined to one side, a unilateral resection was planned. Orthodontic bands and wires were constructed to aid postoperative fixation.

On May 17, under bilateral block anesthesia with 1:50,000 lidocaine (Xylocaine) hydrochloride and ½ grain of morphine sulfate with 1/150 grain of atropine sulfate, incisions were made on

the lingual and buccal aspects of the right mandible at the level of the first bicuspid and the first molar and the mucoperiosteum reflected.

Predetermined measurements indicated that 9 mm. of bone would have to be excised. A series of drill holes were placed in the bone and connected by use of the Gigli saw and chisel. The mylohyoid muscle was detached from the bicuspid portion of bone and the section removed. The left mandibular fragment was rotated medially and joined with the distal fragment, which was also slightly rotated medially. Bleeding from the mandibular canal was controlled with bone wax. The mucosa was resutured and the intermaxillary elastics positioned. These elastics were replaced with wires several days postoperatively, when the possibility of emesis had diminished.

The patient received 300,000 units of penicillin daily for three days postoperatively. Healing was uneventful, and on July 31, 1950, the wires were removed.

CASE 2—(See Fig. 4-6.) A 26 year old man was seen on March 31, 1950, with complaints of difficulty on mastication and a desire to improve his appearance. Physical examination indicated that the mandible was displaced toward the right. The

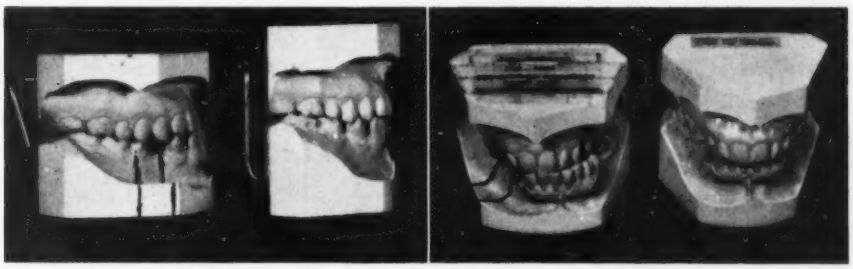


Fig. 2 (Case 1)—Preoperative and postoperative models and photographs

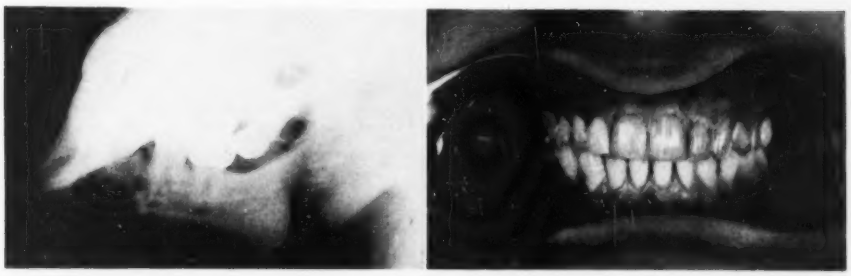


Fig. 3 (Case 1)—Left: Final roentgenograms of the right side of the mandible (February 8, 1951). Right: Postoperative photograph (March 1951)

left side of the mandible was edentulous from the first bicuspid posteriorly. On the basis of study models a predetermined quadrilateral section of bone in the left side of the mandible was marked off for resection.

An acrylic splint was constructed which lay over the edentulous mandible and occluded with the upper left molars. Orthodontic bands were constructed in April, 1950. On June 21, under bilateral mandibular block anesthesia with premedication of ¼ grain of morphine sulfate and 1/150 grain of atropine sulfate and 400,000 units of penicillin, the mucosa was reflected in the edentulous portion of the left side of the mandible and a quadrilateral section of bone removed by the use of drill holes and a Gigli saw. The splint was wired in position by drilling through the alveolus and placing a wire through the bone and acrylic splint. The mucosa was resutured and the orthodontic bands fixed in the new position. Intermaxillary elastics were used until it was safe to attach wires. The postoperative course was uneventful. On September 2, 1950, all traction was removed.

On January 13, 1951, a sequestra, which formed where the wire holding the splint had been placed, was removed; healing was uneventful.

CASE 3—(See Fig. 7-8.) A 24 year old white male was referred because of his desire for correction of the deformity of the left side of his mandible and malocclusion. Physical examination revealed

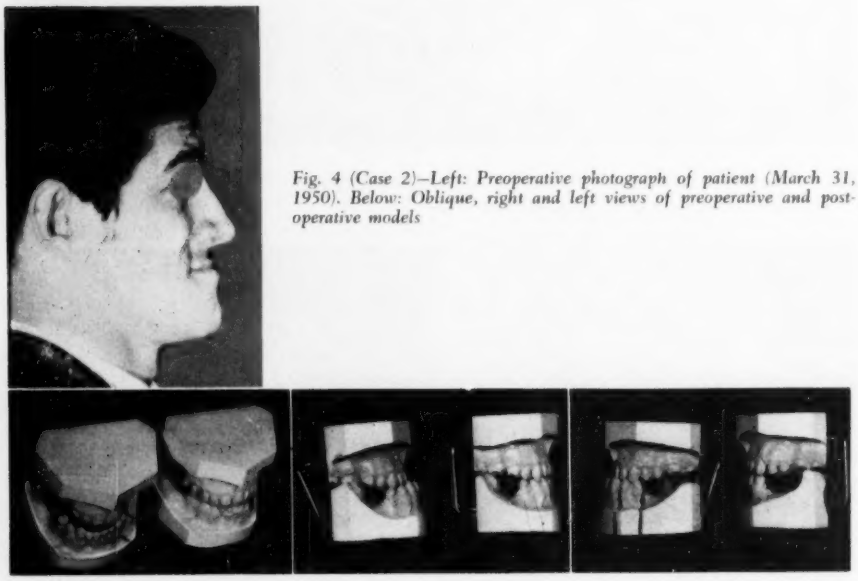


Fig. 4 (Case 2)—Left: Preoperative photograph of patient (March 31, 1950). Below: Oblique, right and left views of preoperative and postoperative models

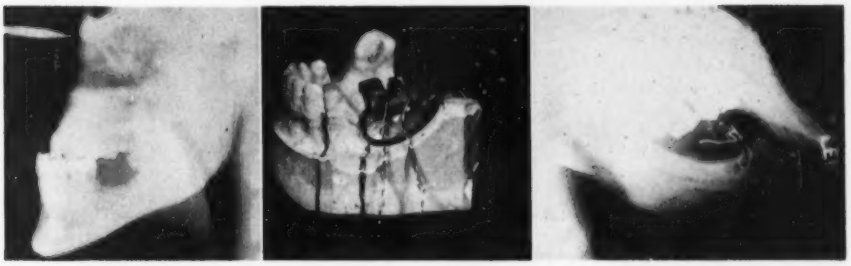


Fig. 5 (Case 2)—Left: Preoperative cephalometric roentgenogram showing extent of prognathism (April 22, 1950). Center: Lower cast showing predetermined section of mandible to be excised and acrylic splint (April 1950). Right: Splint wired to the mandible; roentgenogram taken eight days postoperatively (June 29, 1950)

a healthy man whose mandible was shifted to the right. This gave his chin on the right side undue fullness and also skewed his lips over to the right. The patient said that as a child he could sleep only if his left fist was firmly against the left side of his mandible. The buccal cusps of the teeth of the left side occluded lingually to the upper molars and bicuspids.

On the basis of study models and roentgenograms of the jaws, orthodontic treatment was started on March 4, 1942. Expansion of the upper arch was accomplished in order to improve the functional relationship after ostectomy.

On June 11, 1942, after a complete medical study, the patient was admitted to the hospital. Under block anesthesia and adequate premedication a wide flap was reflected both buccally and lingually in the left side of the mandible. A previously determined portion of mandible was excised by use of the Gigli saw. After

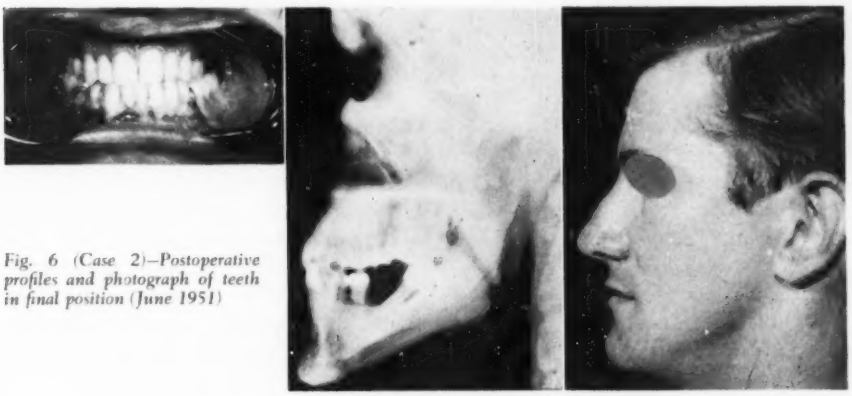


Fig. 6 (Case 2)—Postoperative profiles and photograph of teeth in final position (June 1951)

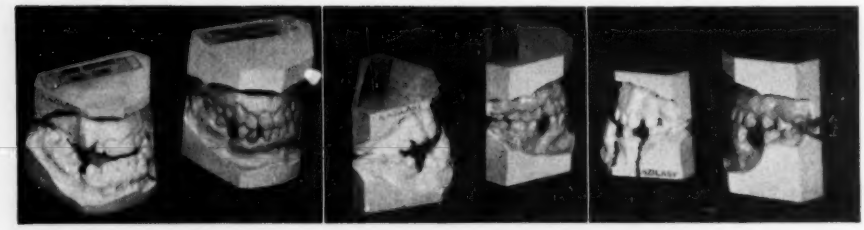


Fig. 7 (Case 3)—Oblique, right and left photographs of preoperative and postoperative models

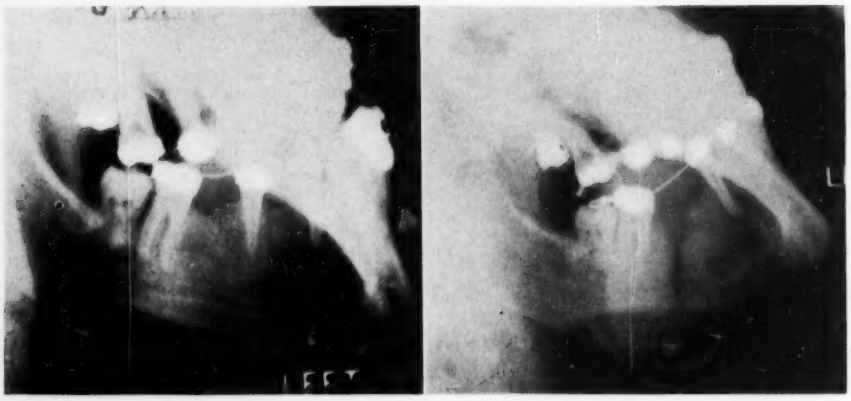


Fig. 8 (Case 3)—Left: Left lateral roentgenogram of mandible two weeks after orthodontic treatment was started (April 1942). Right: Left lateral roentgenogram eight weeks postoperatively (July 23, 1942)

ostectomy the proximal and distal segments were positioned and fixed with orthodontic appliances, which had been placed into position on the teeth prior to the operation.

Healing progressed uneventfully, but in October, 1942, the patient was inducted into the Army. His appliances were still in position. His whereabouts were unknown to us for several years. With the help of the U. S. Army he was located on Wake Island, and we ascertained by correspondence with the commanding dental officer there that the appliances were removed in March, 1943. Roentgenograms and a wax bite, after appliances had been removed, were sent to our office.

The patient finally returned to our office on September 30, 1950, more than eight years after his ostectomy.—*Medical Tower.*

A method of immobilizing a common type of maxillary fracture

■ *Theodore A. Lesney, D.D.S., Honolulu, Hawaii*

Fractures of the maxilla wherein that bone is detached from its cranial base and freely mobile, or detached from its cranial base and displaced in abnormal position, present a constant challenge. The most commonly employed procedures for the immobilization of this fracture, after adequate reduction has been attained, involve the use of an extraoral point of fixation to which the mobile maxilla can be attached for necessary stability during the healing period. This extraoral point of fixation is generally provided in a plaster head cast,[1] a skeletal head frame,[2] or some other form of commonly accepted appliance, such as a head "harness."[3]

To this extraoral point of fixation the maxilla is attached by any one of several well-known methods. The currently more popular methods are based on the craniomaxillary fixation[4, 5] or the craniomandibular fixation principle. The loose maxilla is attached to the plaster head cast, or the head band, by Federspiel transcheek wiring[6]; Kingsley arch bars, or modifications thereof[7]; the Ralph Taylor appliance[8]; or by any other of the many ingenious devices custom-designed to meet the demands of the particular problem at hand.

In this paper are included illustrations from cases in which immobilization of a common type of maxillary fracture was successfully attained by circumzygomatic wiring; in other words, the mobile maxilla was fixed to the zygomatic arches by wire traction for the necessary period of immobilization. With this technic the stainless steel wire is looped circumferentially over the zygomatic arches, and both ends of the wire are carried into the mouth, where they are attached to an intraoral appliance fixed to remaining teeth or dentures.

Obviously, if this procedure is to be employed with success, the zygomatic arches must be reasonably sound. This prerequisite will limit the procedure described to those maxillary fractures below the zygomatic arches (such as bilateral, horizontal or Guérin type fractures) or

The opinions or assertions contained herein are the private ones of the writer and are not to be construed as official or reflecting the views of the Navy Department or the naval service at large.

Commander, Dental Corps, U. S. Navy.

1. Erich, J. B., and Austin, L. T. Traumatic injuries of facial bones. Philadelphia, W. B. Saunders Co., 1944, p. 479-517.

2. Archer, W. H. Manual of anesthesia and oral surgery. Pittsburgh, University of Pittsburgh, 1949, p. 600-603.

3. Bisnoff, H. L. Fractures of the jaws. An external traction appliance. Am. J. Orthodont. & Oral Surg. (Oral Surg. Sect.) 29:96 (Feb.) 1943.

4. Dingman, R. O. Use of rubber bands in the treatment of fractures of the bones of the face and jaws. J.A.D.A. 26:173 (Feb.) 1939.

5. Erich, J. B. Treatment of fractures of the upper jaw. J.A.D.A. 29:783 (May) 1942.

6. Federspiel, M. N. Osteitis of the mandible and maxilla: etiologic factors, diagnosis and treatment of acute and chronic stages. J.A.D.A. 14:1698 (Dec.) 1927.

7. Mead, S. V. Oral surgery, ed. 3. St. Louis, C. V. Mosby Co., 1946, p. 748-768.

8. Yando, A. H., and Taylor, R. W. Fracture of maxillae and mandible. U. S. Naval Med. Bulletin 40:155 (Jan.) 1942.

maxillary fractures mediad and anterior to sound zygomas and zygomatic arches (such as most pyramidal fractures). "Middle-third" facial fractures are no contraindication as long as the major criterion is established—that the zygomas or zygomatic arches that will bear the stress of immobilization are sound. Thoma[9] and Adams[10] described internal wiring of loose maxillas to drill holes in orbital rims and other sound facial bones. Their methods are open operations wherein the sound bone is exposed for drilling. I have no criticism of the procedure; when the zygomatic arches are not sound, I prefer the internal wiring procedure for fixing mobile maxillas to other sound bones in the face. However, the technic described herein is considerably less time-consuming than the methods described by Thoma and Adams and may be considered a closed operation.

Fractures of the facial bones are frequently concomitant with equally, or perhaps more, serious injury. Fracture of the cervical vertebrae, skull fracture, intracranial hemorrhage and brain damage are some of the complicating injuries. In neck fracture, Crutchfield tongs are often used in treatment; these appliances are attached to the outer cortical plate of the parietal bones of the skull. With Crutchfield tongs in position it is impossible to use plaster head casts, head harnesses and other similar extraoral points for fixing mobile maxillas. Skull fracture is considered a contraindication for the use of plaster head casts or similar appliances.

In the event of intracranial hemorrhage, trephinement is commonly employed, wherein a "button" of bone is removed from the calvaria usually at the level of the floor of the middle cranial fossa. Certainly, in cases like this, complicated by "middle-third" facial fractures, plaster head casts and other similar cranial-attached appliances cannot be employed. Drains are placed in the trephined defect, re-exploration may be necessary, and ultimately the wound must be closed. Head appliances would be difficult to retain in position without covering over the trephined area, or in other ways interfering with the more vital treatment of intracranial damage. Patients sustaining brain damage may be unconscious or irrational and irritable for many weeks; it is evident that the use of extraoral appliances to the head in these cases would be impractical.

Fractured maxillas will heal quickly in good position or in malposition; therefore, procrastination beyond 10 to 14 days may cause both the patient and the operator considerable trouble. If the oral surgeon is dependent on various extraoral appliances for managing maxillary fractures complicated by more serious head injury, he may find himself denied the use of these appliances while the patient recovers from his grave injuries. He may then be faced with cosmetic defects as the result of jaws in malposition or in malunion.

The use of circumzygomatic wiring for immobilization of the maxilla offers one possible procedure for solving the problems created by concomitant serious injuries mentioned earlier. Immobilization of a maxilla by circumzygomatic wiring to

9. Thoma, Kurt. Oral surgery, vol. 1. St. Louis, C. V. Mosby Co., 1948, p. 479-489.

10. Adams, W. M. Treatment of facial fractures by wiring fixation. Mississippi Doctor 19:427 (Feb.) 1942.

the zygomatic arches has obvious advantages:

1. All extraoral appliances, such as plaster head casts, skeletal head frames, harnesses, Kingsley arch bars and modifications thereof, are eliminated. Thus the patient attracts no undesirable attention; the hair need not be cut, and no visible scarring results.

2. Immobilizing traction is directed along the most favorable stress lines.

3. The patient may be treated as an outpatient and may be able to work at his occupation.

4. Immobilization for a period exceeding the usual five to six weeks, if additional time is required for any reason, can be conveniently and comfortably maintained.

5. This procedure may offer the only practical means for immobilizing a fractured maxilla complicated by more serious concomitant injury.

The technic employed is certainly subject to further refinement; at present I use the following approach. The basic procedure, reported as simply as possible, is to introduce a circumferential, stainless steel wire around sound zygomatic arches, hereinafter referred to as circumzygomatic wiring. The two ends of the stainless steel wire are inserted through a single needle puncture of the skin overlying the zygomatic arch or the zygoma itself (if equally convenient). They are then brought into

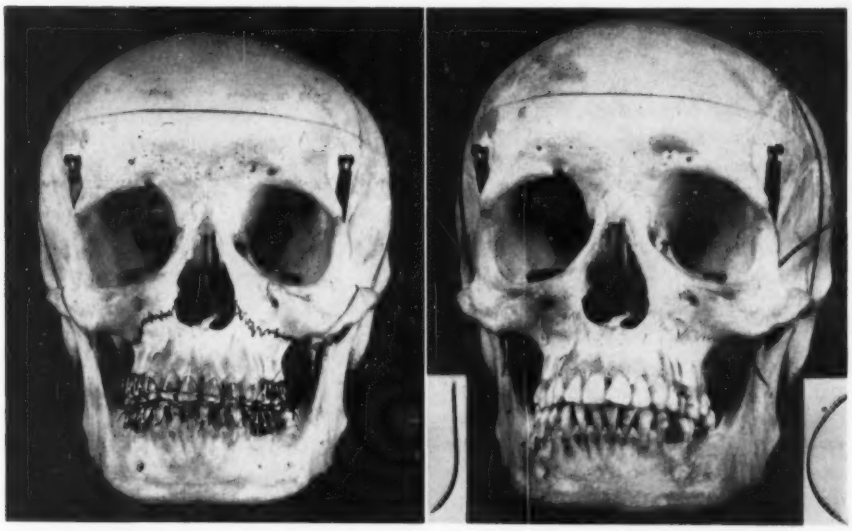


Fig. 1—Left: Circumzygomatic wiring attached to intraoral appliance. Right: Three-eighths circle, skin suture needle straddling the zygomatic arch on the left side. The right zygomatic arch is approached with an autopsy needle, half-curved, cutting edge 3 in. long. This autopsy needle may be slightly more satisfactory than the three-eighths circle skin suture needle

Fig. 2—Path of needle during insertion of medial wire in circumzygomatic wiring. Bony obstruction to the needle during insertion is likely to be the coronoid process of the mandible

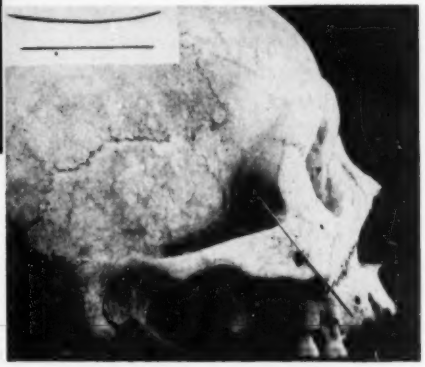


Fig. 3—Path of straight needle in insertion of circumzygomatic wire along lateral aspect of zygoma. A needle bent to slight concavity (with the concavity toward the zygomatic arch) can be used to good advantage. A stylet type needle, or trocar type, is also acceptable

the mouth, in the mucobuccal fold of approximately the second bicuspid area (Fig. 1, left). Thus, the zygomatic arch provides the fixed point to which the mobile maxilla will be fixed after adequate reduction. Stainless steel wire measuring 0.018 in. in diameter (about 25 gage), with low resilience, is found to be satisfactory. A half-round, or three-eighths circle abdominal needle or skin suture needle is effective for placing the wire about the inner or medial aspect of the zygomatic arch. Placing the wire about the lateral or outer aspect of the zygomatic arch can be accomplished with a straight needle. It should be repeated here that the technic is subject to further refinement and that the armamentarium employed can be improved on. One improvement was the use of an autopsy needle for placing the circumzygomatic wiring about the medial aspect of the zygomatic arch (Fig. 1, right). Also, trocar and stylet type needles can be employed effectively for placing wires around the bony arch. The inner aspect of the zygomatic arch is best approached from a point just above the arch, perhaps in the area of the zygomaticotemporal suture line. The skin is punctured under anesthesia, local or general, with the needle that carries the enveloping stainless steel wire, and the point of the needle is carried into the mouth. The ideal portal of exit into the mouth is at the mucobuccal fold of the first molar or second bicuspid areas. It is important that the mouth be closed during this insertion of the needle, so that obstruction from the coronoid process of the mandible is avoided. Opening the

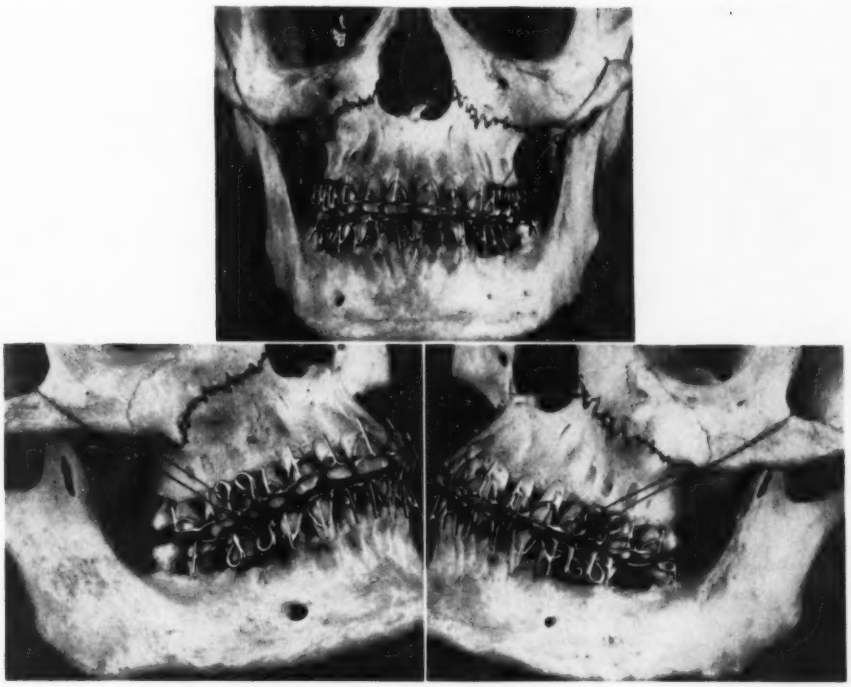


Fig. 4—Circumzygomatic wires attached to custom-designed, cast gold arch bar. If the mandibular fracture is concomitant with a maxillary fracture and immobilization of the jaws is desirable, the circumzygomatic wires can be attached to the mandibular arch bar. If immobilization of the jaws is not necessary, the circumzygomatic wires can be attached to the maxillary arch bar

mouth will place the coronoid process directly in the path of the needle (Fig. 2).

With digital palpation in the mucobuccal fold, the point of the needle can be determined as it approaches the portal of exit into the mouth. At this point, one end of the enveloping wire is in the mouth and the other end is on the face. The length of the wire is on the medial aspect of the zygomatic arch. The end of the wire that is on the face is now threaded through a straight needle, and the needle is introduced through the same skin puncture used to insert the wire medially to the arch, except that the path of the needle is now directed along the lateral or outer aspect of the zygomatic arch (Fig. 3). Now both ends of the wire are in the mouth and ready to be attached to an intraoral appliance (like an arch bar) attached to the upper or the lower dental arch (Fig. 4).

No resultant scar, dimpling or deformity should be evident after the in-

Fig. 5—The curved needle introducing the circumzygomatic wire about the medial aspect of the zygoma probably penetrates the temporalis muscle, perhaps the anterior strands of the masseter muscle, and the buccinator muscle to enter the mouth. The straight needle along the lateral aspect of the zygoma probably penetrates the masseter muscle anteriorly, the zygomaticus, risorius and the buccinator muscles to enter the mouth

sertion of the circumzygomatic wiring, or after treatment has been completed, if a few simple precautions are observed:

1. The path of insertion of both needles, one along the medial aspect and the other along the lateral aspect of the zygoma, originates at the same skin puncture.

2. In inserting the straight needle for the lateral enveloping wire via the original skin puncture, one can stretch the skin downward (because of its considerable mobility) to a point approximating the inferior border of the zygoma or zygomatic arch (as the case may be). In this manner, direct perforation into the mouth is simplified.

3. After the circumzygomatic wire is in position, with both ends in the mouth, the ends should be grasped and traction exerted so that the wire is engaged directly against the bone of the zygoma or the arch. The skin at the site of puncture is manipulated during this procedure to avoid trapping tissue between the two wire strands, thereby avoiding dimpling.

By constantly remaining close to the zygomatic bone with the inserting needles and wires, branches of the seventh cranial nerve may be avoided (Fig. 5).

With the circumzygomatic wires in position, the two ends in the mouth can be attached to a previously inserted intraoral appliance fixed to the teeth. Of course it is understood that prior to immobilization of the maxilla the fracture has been reduced by one of many means, often with the employment, at one stage or another, of intermaxillary interdigitation of the teeth. Should it be desirable to continue immobilization of the jaws with the teeth in occlusion, one can attach the circumzygomatic wires to the mandibular appliance. If the mobile maxilla can be

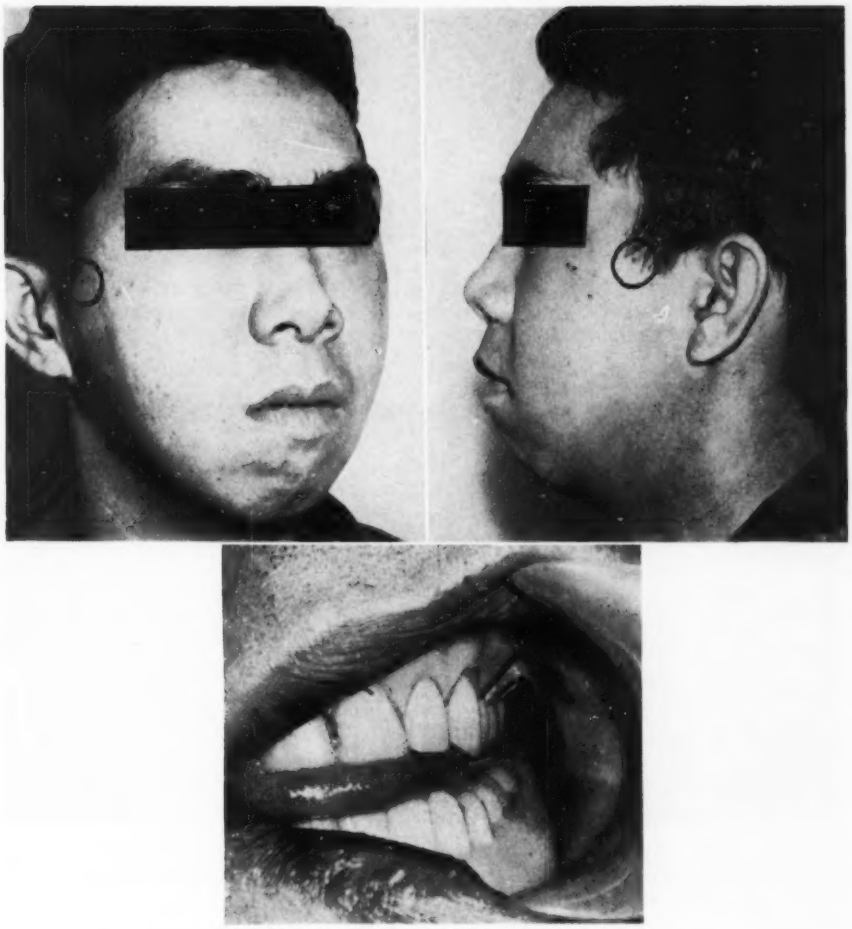


Fig. 6—Patient immediately after placement of circumzygomatic wiring under local anesthesia. Outlines are the points at which the skin was penetrated to introduce the needles carrying the circumzygomatic wires. The wires were attached to the first bicuspid tooth of a maxillary denture as illustrated

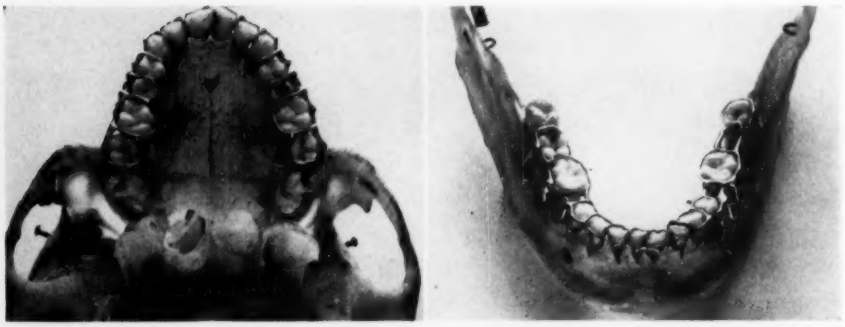


Fig. 7—Custom-designed intraoral arch bars of this type, as conceived by Edwin B. Smith, Jr., are effective. They can be wired directly to the dentition, have numerous spurs for intermaxillary immobilization (should that be desired as supportive) and provide loops in the bicuspid and molar areas for attachment of the circumzygomatic wires

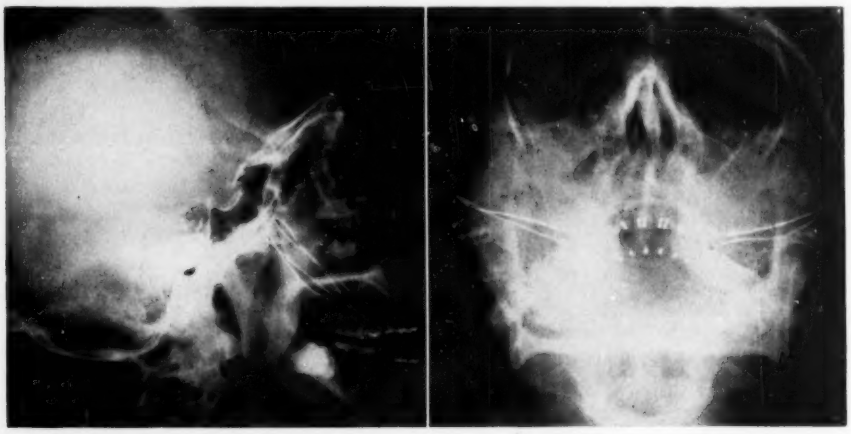


Fig. 8—Same case as is shown in Figure 7 with circumzygomatic wires in position. This shows a freely mobile, horizontal fracture of the maxilla, adequately reduced but needing immobilization. Patient is wearing full upper and lower dentures

reduced in such a manner that wiring the teeth together is not necessary, then it can be immobilized by attaching the circumzygomatic wires to the maxillary arch bar, thereby allowing mandibular motion.

Recently, in a completely edentulous patient (Fig. 6), the circumzygomatic wires were attached to the maxillary denture. In other cases, dental arch bars, acrylic resin splints and custom-designed, metallic castings were used with equal efficiency (Fig. 7, 8).

Technic for creating an emergency airway in cases of respiratory obstruction

■ *L. M. Monheim, D.D.S., Pittsburgh*

Acute complete respiratory obstruction, from whatever cause, can terminate fatally unless it is treated immediately since the body does not store oxygen and cardiac reserve is an extremely uncertain quantity. Some such complications that have terminated fatally could have been prevented if the patient had received just enough oxygen to sustain life until the obstruction was relieved or corrected.

During anesthesia for oral surgery, particularly with ambulatory patients who are treated in the office, the vast majority of complications are respiratory in nature. This is readily understandable when it is remembered that the oral surgeon is operating within the upper respiratory tract, and blood and tooth particles are an ever-present by-product of his procedures. Also, the patient is carried in as light a plane of anesthesia as possible so as not to retard the recovery time. This, of course, predisposes the patient to certain laryngeal reflexes which may terminate in a laryngeal spasm. Or the obstruction may be caused by a foreign object slipping into the retropharynx and becoming impacted in the larynx.

In such an extreme emergency, when it may be impossible to get sufficient oxygen past the obstruction and into the lungs, a no. 13 gauge needle can be inserted into the trachea below the site of obstruction (Fig. 1). Since the vast majority of obstructions (practically 100 per cent) occur at the larynx, the no. 13 gauge needle can be inserted into the cricothyroid membrane, which lies between the thyroid and cricoid cartilages, or between the first and second cartilaginous rings (Fig. 2). This will afford the patient a sufficient intake of oxygen until the obstruction can be corrected or removed.

If the no. 13 gauge needle is inserted in the midline at the afore-mentioned sites, it will be possible to penetrate into the trachea without difficulty. The large vessels in this particular region course to the lateral side of the trachea and will not be penetrated by the needle. It is also a simple matter to determine when the needle has penetrated into the trachea, for air can be aspirated.

After the obstruction has been corrected or eliminated, the needle may be withdrawn without any permanent damage to the patient. It should be borne in mind, however, that the needle must be kept sterile and ready for this procedure. The skin can be prepared in a matter of a very few seconds with any suitable and approved sterilizing solution.

Professor of anesthesia, University of Pittsburgh, School of Dentistry; assistant professor of anesthesia, University of Pittsburgh, School of Medicine, and assistant director, department of anesthesia, Medical Center Hospitals.

Fig. 1—Anterior view showing area of insertion

Fig. 2—Lateral view with needle in place

The greatest advantage of this particular technic is that it can be accomplished in a matter of seconds, and the needle can be withdrawn without incapacitating the patient.

This technic as described has been used with success in two cases. In both instances the needle was inserted and kept in place until the obstruction was eliminated. It was then removed without ill effect to the patient. It is felt that in both cases it was a life-saving procedure.

■ Translating Research Into Action

A chronic problem for the scientist is the translation of research into action. Here the scientist is faced with a dilemma. If he himself devotes attention to application of his results, then he no longer has time for more research; if he does not apply his results, then the work may be neglected for years. The research man wants to continue his investigations and also wants to apply his results. The solution of this problem can be found by better understanding between the investigator and the administrator.

One aspect of the general problem is the difficulty of obtaining means to conduct ecological research before a situation reaches an emergency state. This condition can be traced largely to a failure of ecologists and administrators to understand one another. Ecologists have lacked imagination in application of their results, and administrators have been submerged in daily routine. The result is that, when a situation becomes critical, the ecologist has no information and the administrator is so busy "doing something" that he couldn't utilize information if he could get it.—*David E. Davis, "Symposium on the Application of Ecology to Water Conservation," The Scientific Monthly 73:343, December, 1951.*

Writing for reading

■ *Myron Kaufman, D.D.S., Detroit*

Literature is the backbone of the healing arts. Professional progress is achieved by the sharing of knowledge. It is, therefore, obligatory for those who have valuable scientific information or who have noted important clinical observations to communicate their knowledge to their colleagues in the best readable form.

It is unfortunate, but true, that many manuscripts never reach the printed page. Journals are limited in space and this, of necessity, confines the choice of manuscripts to the highly desirable few. Many articles are sent back to the author because they repeat an old story or are out-dated by the time they are submitted for publication. Some articles are not suitable for periodical publication because they were originally prepared for oral delivery and have not been properly adapted for publication. While the length of an article is governed by the amount of material which must be communicated to the reader, undue length is a valid reason for an editor's rejection. Conciseness is the keynote to good writing, and ample cutting may be necessary after the editor has returned the paper for revision.

It is not the purpose of this paper to introduce new aspects of medical writing but to emphasize certain qualities of scientific writing which make for good reading and hence acceptance as good literature.

■ *Types of Scientific Articles*

A few basic types of scientific articles have been classified[1] as follows:

1. The review of literature is invaluable if properly planned and concisely presented. It crystallizes all available knowledge on a given subject for the reader and serves to bring him up to date in one article. The writer must first, of course, be completely familiar with the subject and all available pertinent literature.

2. The essay differs from the usual scientific paper in that the writer discusses subjects of educational, economic or social interest rather than scientific facts. The essay tends toward analysis and has more literary latitude than the scientific paper.

3. The complete discussion of a single disease usually is and should be reserved for textbooks and reference works. It warrants periodical publication only when new aspects of it have been found or when a new interpretation of the disease should be called to the attention of the profession. The accepted sequence for discussion of a disease is definition, etiology, pathology, epidemiology, symptoms, diagnosis, prognosis, complica-

Department of oral surgery, Mount Carmel Mercy Hospital.

1. Fishbein, Morris. Medical writing, ed. 2. Philadelphia, Blakiston Co., 1948.

tions and sequelae, prophylaxis and treatment.

4. The report of scientific investigation should present findings that significantly contribute to scientific information. Only essential facts should be given and unnecessary data and material omitted. This report is valid only when recognized research methods are used to collect and correlate the data. An authoritative manual[2] suggests an outline for the research report as follows: title, introduction, review of pertinent literature, presentation of original data, discussion and evaluation of information, summary, conclusions and bibliography.

5. The case report has been termed the foundation of clinical medical literature. Careful selection of the case to be reported is a prime consideration. It should add to the knowledge of a disease, not repeat an oft told clinicopathologic picture. Brevity, compactness, and limitation to positive observations and essentials are requisites. A short definition of the disease, bibliographical reference to complete description or review, and reasons for reporting should preface the actual case reports. The case should be reported in simple narrative style and in logical and chronological order. It should conclude with a short summary of the significant facts and observations.

6. The description of a new technic or treatment should discuss only the salient features. The value of this type of paper is obvious.

7. Descriptions of new instruments should include brief instructions for use and application along with photographs and diagrammatic drawings. Only instruments which have been put to severe clinical scrutiny and which have proved to be of value are worthy of consideration.

8. Clinical notes or suggestions are brief reports of minor clinical observations, unusual occurrences, or short cuts in technic or treatment. They may be written in terse form in a letter to the editor, or in a brief impersonal paragraph.

9. The monograph is a special treatise on a single subject carried beyond the review of literature or the complete discussion of a single disease. It is the form in which an authority correlates his observations in a particular field. Because of their length, monographs seldom are published in periodicals.

■ *Preparing to Write*

Once the article has been classified according to type, the writer prepares a tentative outline of his subject, which should be consistent with the accepted style for the type. The desired topic headings are listed in logical sequence and can be modified as material is added or subtracted. This outline is progressively elaborated through notes which contain the writer's thoughts, observations, experimental results and reference readings. A satisfactory method is to use 5 by 8 inch index cards with the outline topic at the top of the card and space beneath to list the reference sources. Writing is facilitated by arranging and referring to the cards as each topic of the outline is discussed.

It is essential that complete familiarity with the previous literature on the subject

2. University of Michigan, School of Dentistry. Report writing in dentistry, ed. 2. Ann Arbor, Mich., Overbeck Co., 1952.

be attained prior to the planning of a scientific article. A complete list of books and journals that contain relative material should be prepared first. There are a number of sources from which such a list may be made.[3]

1. The card catalogue is a record of the books within a library.

2. The periodical index is an alphabetical key to authors and subjects of articles published in journals. This index will indicate the volumes, pages and dates of issues in which the articles appear. The following indexes are considered satisfactory for scientific use: *Quarterly Cumulative Index Medicus, Index to Dental Periodical Literature, Current List of Medical Literature, and the Index Catalogue of the Library of the Surgeon General's Office.*

3. Abstract journals summarize the essentials of scientific articles, thus offering the investigator a quick insight as to their relative value for his problem. The *Quarterly Review of Medicine, Excerpta Medica* and *International Medical Digest* are examples.

4. Annual reviews and yearbooks offer critical reviews of scientific articles published each year. Dentistry and each specialty of medicine have their own yearbooks which list all worthwhile articles on a particular subject published during any given year.

5. The *Recent Advance Series* reviews the literature over a several year period and summarizes the progress made in a field during that period. *Recent Advances in Medicine* and *Recent Advances in Physiology* are examples.

6. Review journals summarize known knowledge of a particular phase of science. *Medicine, Chemical Reviews* and *Physiological Reviews* are examples in their fields.

At times even these sources fail to supply all of the material needed on a given problem. Bibliographies which follow the chapters in standard textbooks and consultation with a well qualified reference librarian will aid in obtaining specialized information. Secondary source material, such as reviews and abstracts, cannot be depended on for accuracy, and therefore if an author chooses to utilize previous literature for his own article, he should always refer to the original publication.

When all available information has been compiled and the first draft of the paper is to be written, certain standard general reference books should be at hand —a handbook on scientific writing, authoritative standard and medical dictionaries, a book of synonyms and a good book on English composition.

■ *Principles of Scientific Writing*

Scientific publications demand precision and accuracy, but the readability of an article is a complement to the author's style. A pleasing style combined with cor rect English usage should do much to improve the quality of professional literature. Individuality in composition should be encouraged, but it should be restrained by the essentials of good scientific writing —brevity, conciseness, simplicity, directness and exactness. Wording and phrasing

3. Trelease, S. F. The scientific paper, how to prepare it, how to write it, ed. 2. Baltimore, Williams & Wilkins Co., 1951.

that are obscure, ambiguous, inappropriate, verbose, and not accepted by good usage should be avoided.

Acceptable grammar is a *sine qua non* for any publication. Mastery of the essentials of grammar and usage is fundamental to correct, clear expression. To have a good idea and to express that idea with grammatical correctness are not always sufficient, however. An author must aim at expressing the idea forcefully and effectively. Scientific writing is dignified writing. Occupational jargon commonly accepted for patient histories, progress notes and records must be rigidly avoided.

The importance of an appropriate title cannot be overstressed. It designates the subject, attracts the reader and provides the essential aid for indexing the article. Interrogations are unacceptable as titles, and attention-gaining titles are acceptable only when they express the content of the paper and avoid inanity and flippancy.

The introduction should present a short, clear statement of the subject and purpose of the paper. It should tell the reader what the writer proposes to do and stimulate his further interest by an attention-getting sentence or paragraph. The introduction, the body of the paper, and the conclusion, however, must all be closely related to the subject matter.

The body of the paper is usually followed by a summary, which is a condensed account of the paper, the important findings, and the writer's viewpoint on the topic. The practical value of the paper and the writer's recommendation for further study may be mentioned here. The summary is a courtesy to the busy reader as it presents the pertinent facts in a digest that can be assimilated quickly. Summaries are neither necessary nor usual in certain types of scientific writings.

Conclusions to the scientific paper may be brief statements of findings based on data presented or reviewed. They are usually mere sentence statements listed in numerical order.

A numerical list of references, the bibliography, closes the paper. The references should be accurate and follow the bibliographical style of the publication to which the paper is to be submitted. Most publications follow the style of the *Quarterly Cumulative Index Medicus*. For periodicals, the following data should be given and in the order indicated: last name of the author followed by initials or first name, title of the article, name of the publication followed by the volume number (in Arabic with a colon), the page, month and year. For books, the following information is required: last name of the author followed by initials, title of the book, edition, city where published, name of the publisher, year of publication and page referred to if desired.

References should be limited to significant ones. It is not necessary to cite everything read on the subject reported. It is sufficient to record for publication only references which are applicable to the development of the writer's ideas and evidence.

Specific allusions in the text, including direct quotations and paraphrased remarks, are acknowledged by placing a number, like an exponent, above and after them. This number must correspond to the numbers in the bibliography which are listed in sequence.

The use of explanatory footnotes is to

be avoided (except to acknowledge indebtedness), for if material is indispensable for clarification, it should be included in the text. Footnotes are used by the editor or publisher, however, for references to the title or author.

Illustrations contribute much to the clarity and effectiveness of a scientific paper.[4] These illustrations should be originals, if possible, be unmounted and numbered with the author's name and title of the paper on the margin or back. They should be clear, artistic, informative and of uniform style and lettering. The writer should direct the reader's attention to the illustration by inserting figure numbers at the appropriate place in the paper. The legend describing the illustration should be brief and need not be in sentence form, nor should it repeat statements made in the text. Legends should be listed on a separate page, with numbers corresponding to those on the photographs and drawings.

In planning the use of statistics in a scientific paper, it is imperative that the writer determine whether the statistics can be used to draw significant conclusions. He should refer to a handbook of scientific writing for the best methods of presenting statistical data.

■ *Summary*

The writer of a scientific article suitable for publication must master the devices of good journalistic form. His aim should be to write in an acceptable scientific fashion which is based on the principles of approved English composition. He must critically evaluate the available literature and data and accurately report his bibliography. All this, complemented by the development of a readable and interesting style, will do much to elevate the standard of scientific writing.

4. Jordan, E. P., and Shepard, W. C. Rx for medical writing. Philadelphia, W. B. Saunders Co., 1952.

■ JUDGMENT

Judgment is a great asset; it makes the diagnostician and the surgeon both supermen.—*C. H. Mayo, "Renal and Ureteral Stone," International Journal of Medicine and Surgery 42:613, December, 1929.*

VOLUME 11 • JANUARY 1953 • NUMBER 1 CASE REPORTS

Malignant transformation of odontogenic cyst: *report of case*

■ *Charles G. Darlington, M.D.; Harry E. Ehrlich, M.D., and Harry M. Seldin, D.D.S., New York*

Generally, at operation, an odontogenic, or dental, cyst will be seen as a thick-walled, fluid-filled sac, which peels cleanly away from its encapsulating compact bone. This general finding may be modified by the position of the lesion and the degree of secondary infection.

Under the microscope, a section of such a cyst would show its sac to be composed in the main of fibrous connective tissue, the inner surface being lined with epithelium of the stratified squamous type. The cyst content is usually a clear, amber-colored fluid. It may contain cholesterin crystals, or it may be mucoid, thick and cheesy, when infection is present. In the latter case the cyst contents will contain, in addition to desquamated epithelial cells, bacteria and pus.

Malignant epithelial tumors rarely occur within bone as primary tumors, although several reports of carcinomatous changes in odontogenic cysts can be found in the literature.[1-4] It is interesting to note that the epithelial type of carcinoma is the only type that has been reported as arising from odontogenic cysts. These facts would lead us to two important questions: (1) What is the origin of odontogenic cyst epithelium? (2) What factors operate to cause the usually benign epithelium to become malignant?

Although there is general agreement concerning the answer to the first question; namely, that the cyst epithelium is derived from the enamel organ, or the epithelial rests of Malassez, the answer to the second question is still beyond the realm of present day knowledge.

In the case reported here, the diagnosis of carcinoma was never in doubt. The pathogenesis was, however, doubtful. Did this carcinoma occur as the result of the patient's originally having had a benign odontogenic cyst, which eventually underwent malignant changes in its epithelial elements, or was the carcinomatous change the result of a primary lesion in the antrum with subsequent extension to a pre-existing dental cyst? We are of the opinion that this lesion was the result of a malignant change in the dental cyst. Following is the evidence that supports this view and tends to negate the other: In the original sections one edge of the specimen reveals antral

1. Thoma, K. H., *Clinical Pathology of the Jaws*. Springfield: Charles C Thomas, 1934.
2. Mann, J. B.; Ash, J. E., and Bernier, J. L., *Atlas of Dental and Oral Pathology*, ed. 3. Chicago: American Dental Association, 1944.
3. Sealey, V. T., Epitheliomatous Development in Dental Cyst. *Austral. J. Den.* 51:83 (March) 1947.
4. Frankl, Z., and Weisner, J., Cancer Starting from a Cyst. *D. Items Interest* 71:564 (June) 1949.

epithelial lining without any features of malignancy. Away from or beneath this antral mucosa are numerous foci or seedings presenting malignant features. These definitely appear to be of epithelial origin. Are these cells transitional or squamous in type, or do they resemble epiderm of tooth anlage type? We feel they resemble the latter more than the former; in addition, many such areas are associated with structures which we interpret to be of mesenchymal tooth anlage origin.

The second sections, made from operative material after the partial maxillary resection, again show uninvolved antral mucosa. They further show a decidedly smaller amount of malignant cells. These cells, again interpreted as of epithelial origin, bear a slightly greater resemblance to a transitional type than do those seen in previous sections, but even here we feel they suggest odontogenic origin and in one or two places simulate an ameloblastic type.

The appearance of the gross specimen further supports the diagnosis of odontogenic cyst. The roentgenographic findings as well as the clinical and operative evidence also support this diagnosis.

REPORT OF CASE—The patient, a 48 year old, white man, first came to our office on February 2, 1949. His chief complaint was pain and swelling in the upper right molar region. He had had dizzy spells for the previous year and a half. One year previously a tentative diagnosis of Ménière's syndrome was made. The present pain and swelling first occurred about one year previously. At that time an incision was made in the mucobuccal fold, after which the symptoms subsided. Six months later a temporary filling was inserted in the upper right second molar.

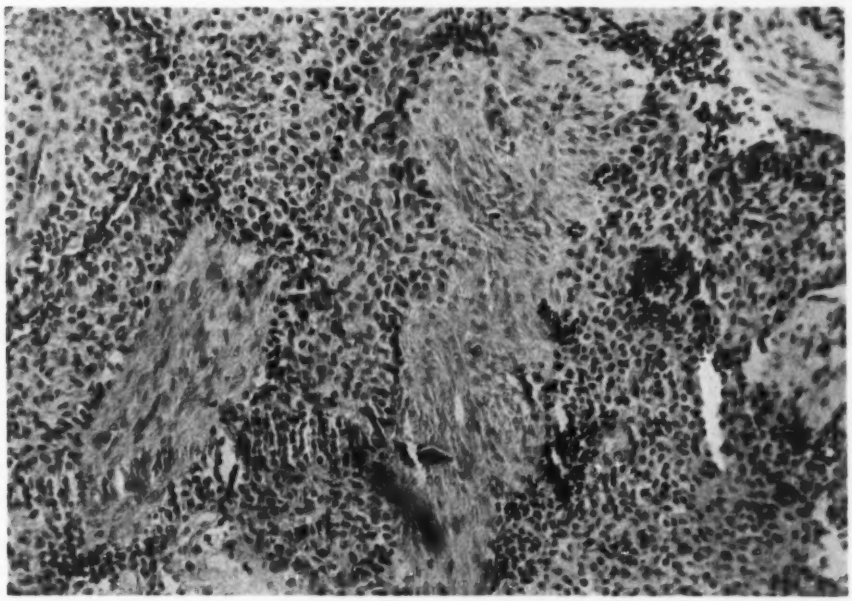


Fig. 1.—Microscopic section of cyst showing unbalanced proliferation of anaplastic epithelial cell derivatives in sac wall. Cells frequently line up in peripheral palisade against environmental stroma

Several months later pain and swelling recurred and persisted. Examination revealed a crepitant swelling in the mucobuccal fold opposite the upper right second molar. Roentgenograms revealed a cystlike expansion and thinning of the bone of the right maxilla, possibly involving the floor of the maxillary sinus. A tentative diagnosis of "radicular cyst" was made, and an exploratory operation was performed.

OPERATION—With nitrous oxide-oxygen anesthesia, a vertical incision was made in the upper right cuspid region, and the entire buccal mucoperiosteum was retracted from the cuspid to the upper right third molar. The buccal plate was found to be partially destroyed, and the roots of the upper right second molar were involved in the lesion. This tooth and some of the thin overlying buccal plate were removed, thus exposing the cyst. The cyst was found to be degenerated, necessitating its removal in two sections. The lesion had encroached on and destroyed a portion of the antral floor. The mucoperiosteal flap was replaced and maintained with interrupted sutures.

Examination of the specimen revealed a hard mass in one part of the cyst wall. This was not the usual consistency of a cyst membrane and suggested possible malignant changes in the cyst wall. Two pieces of tissue were sent for microscopic examination: (1) an oval piece, a composite of hard and soft tissue, and (2) the cyst sac (Fig. 1-3).

MICROSCOPIC DESCRIPTION—The recesses of a cystic cavity as disclosed by the roentgenogram and found grossly were well defined in the microscopic specimen. In more than one field the relation of this cavity to the antrum; that is, the antral floor, could also be defined.

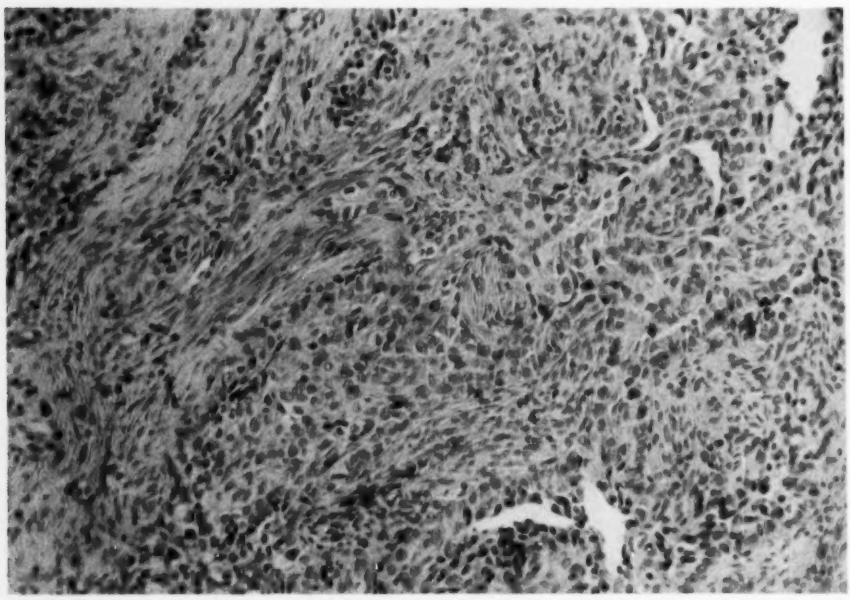


Fig. 2.—Original section showing anaplastic epithelial cell mat with a minimum of stroma. Several fissural clefts may well represent recesses of major cyst cavity

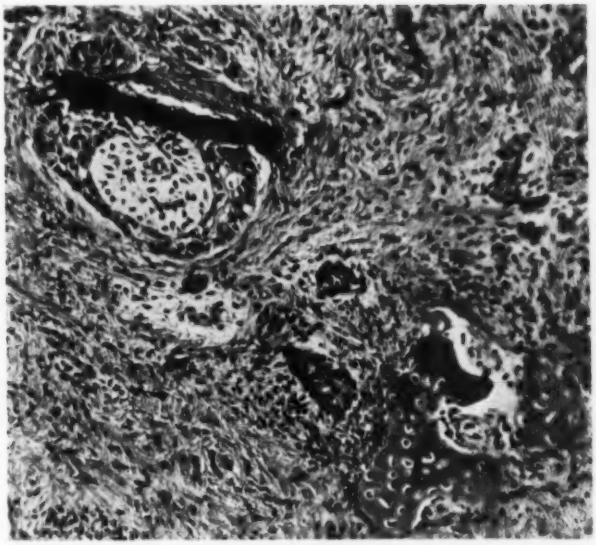


Fig. 3—Second section of resected maxilla showing "lagoons" and cords of anaplastic cells seeding stroma. Cells are reminiscent of the epithelial rest, or tooth anlage

Antral epithelium, essentially unchanged, appeared along one margin of a strip of tissue that included several nests of mucous glands and serving ducts, plated bone and skeletal fibrous connective tissue. Along the other margin there was epithelium which lined the cyst. Where cellular hyperplasia had not resulted in unbalanced proliferation inward and outward, the lining was about two cells deep. Cells were low columnar, if not cuboidal, with deep-staining nuclei. Unrestrained proliferation of these cells did take place, however, and fungating cell masses hung into the cavity and seeded the wall of the cyst. In some fields pools of these anaplastic cells were rather large. (Rarely are these packets found around the filament of a nerve.) In all fields the peripheral cells "lined up" rather regularly against the environmental stroma. In several fields the central cells of the packet seemed to be bogged down with mucus, although no mature acini or ducts were formed. Giant cells reacted vigorously to extravasated blood in the supporting stroma of the wall of the sac.

PATHOLOGIC DIAGNOSIS—The diagnosis was carcinomatous changes (ameloblastic) in an odontogenic cyst. The slides were reviewed by another pathologist, whose diagnosis was essentially the same; namely, squamous cell carcinoma in a follicular cyst.

The patient was referred to an oncologist, who noted no significantly enlarged lymph nodes palpable in the neck. There was a recently healed tooth socket of the upper right second molar. No bony abnormalities were noted in the mouth, nor were any such abnormalities found in the nose.

OPERATION—The patient was admitted to the Mount Sinai Hospital, New York, on March 28, 1949, and operation was performed the following day. With general anesthesia the right external carotid artery was exposed through a transverse 3 cm. incision in the upper part of the neck and ligated above the superior thyroid branch with heavy black silk. The neck wound was then closed. The remaining teeth on the upper right side, up to and

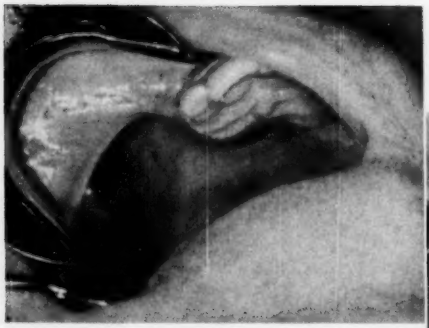


Fig. 4.—Left: Intraoral defect lined with split-thickness skin

Right: Obturator denture in place

including the upper right cuspid, were removed. A cheek flap was then developed by splitting of the upper lip and carrying of the incision around the right ala nasi and up along the nasomolar groove to the inner canthus. The maxilla was resected, with removal of the anterior and medial walls and the floor of the antrum. The corresponding nasal conchi were also excised. The tuberosity was preserved, to allow better denture retention. The intraoral defect was lined with split-thickness skin cut from the opposite thigh (Fig. 4, left). The cheek flap was restored and sutured into place. The skin graft was covered with parresined lace-mesh surgical dressing and pressure maintained by packing of the cavity with Cornish wool.

The postoperative regimen consisted of nasal feedings, vitamin therapy and administration of penicillin. The patient's course was uneventful, and he was discharged from the hospital on the eighteenth postoperative day, wearing a temporary obturator. Six months later, after maximum shrinkage of the transmaxillary stoma, a permanent prosthesis was constructed (Fig. 4, right).

PATHOLOGIC REPORT ON THE SURGICAL SPECIMEN—The pathological report on the surgical specimen was as follows: fully developed epidermoid carcinoma in odontogenic tissue (malignant adamantinoma), invading bone; all resected margins were clear of tumor tissue.

SUBSEQUENT COURSE—Follow-up examinations have revealed no evidence of local recurrence or metastasis. The patient has no complaints and wears his prosthesis with comfort. He has resumed his occupation as a social work administrator. The dizzy spells have disappeared. At present, more than two years after surgery, there is no evidence of recurrence of the neoplasm. The patient has gained weight and continues his business routine. He wears the denture comfortably, and his speech is normal.

CONCLUSION—The early detection of cancer requires the microscopic examination of all suspicious or abnormal tissue. The close cooperation of oral surgeon, pathologist and oncologist is essential for adequate treatment of oral cancer.—477 *First Avenue.*

Sequestrectomy and immediate bone graft in osteomyelitis of the mandible following fracture: *report of case*

■ *Hubert J. Patrick Donnelly, D.D.S., Palo Alto, Calif.*

Compound fractures of the jaw are frequently complicated by osteomyelitis. A compound fracture involving a tooth socket may be followed by contamination by the organisms of the oral cavity, with infection at the fracture site. Infected fractures, if not treated properly by incision and drainage and by adequate antibiotic therapy, may result in the development of osteomyelitis. Osteomyelitis superimposed on a fracture presents a serious complication, since the bone loss of sequestration causes a severe deformity in the bone and may result in facial deformity and malocclusion.

The case reported herein is of a mandibular fracture complicated by osteomyelitis.

REPORT OF CASE—A negro, aged 27, first came to the Cook County Hospital Oral Surgery Clinic on June 14, 1948, with pain and swelling on the left side of the face and inability to eat or to close his mouth. He had been robbed and assaulted three days previously.

While in the Army, in 1947, he had been treated for gonorrhea and syphilis. The past history was otherwise noncontributory.

On June 16 the fracture was reduced and immobilized with arch bars and intermaxillary elastics (Fig. 1).

The postoperative course was uneventful until July 13, 1948. The patient returned with a moderate swelling in the region of the symphysis. The swelling had ruptured and was draining pus. The area was incised and drained. He was treated with sulfathiazole, 3 Gm., immediately, then 60 mg. every four hours. Hot wet compresses and hot intraoral irrigations were used.

On July 19, 1948, there was no active suppuration. The swelling had subsided and the drain was removed.

He did not return until July 27. At this time he was first seen by me and the disease had reached an advanced stage.

Examination revealed a fracture of the mandible in the region of the left cuspid. The oral hygiene was fairly good. The chin was slightly swollen and a fistula was present just lateral to the symphysis and near the lower border on the left side, which was discharging frank pus. An area of denuded bone was detected when the fistula was explored with a probe (Fig. 2). This area seemed extensive and suggested a sequestrum. Roentgenograms made on July 27, 1948, revealed extensive bony destruction of the mandible, extending from the left first bicuspid region to the right cuspid region, and a fracture lateral to the symphysis on the left (Fig. 3). The diagnosis was osteomyelitis.

General physical examination showed a well developed, well nourished man, who appeared to be in good health. He was only fairly cooperative and of fair intelligence. Results of the ear, nose and throat examination were negative. The teeth were in fair repair. They were fixed in occlusion with intermaxillary rubber band traction on arch bars. A fistula discharging purulent material was present on the left side of the chin. Otherwise results of the examination were negative. The serologic reaction of the blood was negative, and the blood and urine examinations disclosed no abnormalities. The bacteriological examination showed nonhemolytic *Staphylococcus albus*.

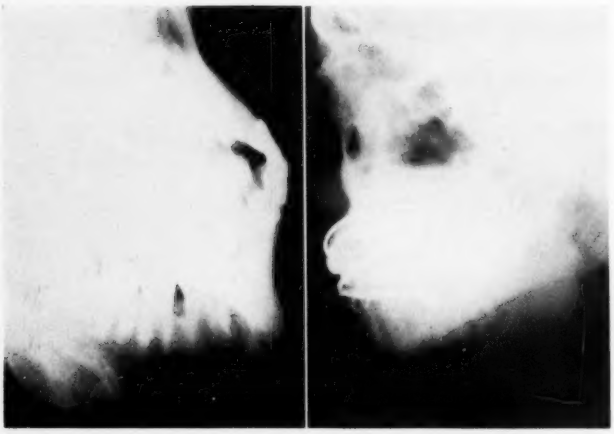


Fig. 1—Left: Lateral view of mandible, June 16, 1948, showing fracture line with displacement prior to reduction and immobilization with arch bars and intermaxillary elastics. Right: Lateral view just after reduction and immobilization

On July 30, 1948, the patient was admitted to Cook County Hospital. The axillary temperature was 99° F. He was treated with penicillin, 40,000 units every three hours; hot wet compresses to the face every three hours; hot intraoral saline irrigations every three hours; ascorbic acid, 100 mg. three times daily; a liquid diet of 3,000 calories with 100 Gm. of protein; and 10 grains of a preparation of acetylsalicylic acid, phenacetin and caffeine citrate to alleviate the pain. A culture was obtained from the draining sinus.

On August 2 he was comfortable and afebrile.

On August 4 roentgenograms revealed a large area of bone destruction on either side of the fracture site (Fig. 4). Drainage continued from the sinus. The dose of penicillin was increased to 50,000 units given every three hours.

On August 12, 1948, under intratracheal thiopental sodium and nitrous oxide-oxygen anesthesia, a five inch incision was made parallel to and one inch below the crest of the right ilium and a large section of iliac bone was removed for a graft. An incision was made from the first molar region of the left side of the mandible to the first molar region of the right side of the mandible, just inferior to the lower border. The incision extended to bone. The soft tissues were retracted to expose the fracture site. Necrotic bone was removed with rongeur forceps, curets and bone files until healthy bone was reached on both fragments. A triangular shaped defect remained, measuring 3.5 cm. at its base, on the lower border of the mandible. The defect extended superiorly to the oral cavity, exposing the apexes of the left lateral incisor and cuspid, necessitating their removal. A Lane plate was then contoured to the mandible and secured with screws, maintaining the defect space. Occlusion was maintained by arch bars and intermaxillary elastics, which were present previous to surgical intervention. The defect was then filled with a wedge-shaped piece of medullary iliac bone. The wound was sprinkled with sulfathiazole crystals and closed in layers. A pressure dressing was applied.

On August 13 the patient was afebrile. He got out of bed and walked a short distance. Treatment with penicillin was continued.

On August 16 alternate sutures were removed from the skin. Roentgenograms revealed the wound was healing satisfactorily with no drainage (Fig. 5) and on August 18, all sutures were removed from the iliac area. On August 20 all remaining sutures were removed from the skin of the face.

Fig. 2—Draining fistula and small area of necrotic bone protruding through opening

On August 23 the patient was comfortable and afebrile and both wounds were well healed. He was discharged and all treatment discontinued. He was seen as an outpatient from August 30 until October 1 at weekly intervals. On October 1, 1948, intermaxillary wires and arch bars were removed and the patient was dismissed in good condition.

SUMMARY—The case reported is one of osteomyelitis following a compound fracture of the mandible with a tooth in the line of fracture. Reduction and immobilization were not accomplished until five days after the fracture had occurred. The patient was seen every week for four weeks, when acute cellulitis was observed. At this time the patient should have been admitted to the hospital for adequate treatment. Instead, incision and drainage were performed and he was given a prescription for sulfadiazine tablets. He was also instructed to use hot facial compresses. This treatment was presumably carried out for two weeks, when the patient was seen by me and admitted to the hospital for surgical intervention as described; that is, sequestrectomy, bone graft from the ilium and Lane plate insertion, to maintain space and prevent deformity. Primary closure of the wound was performed.

The procedure carried out has many advantages and, with the availability of penicillin and chemotherapy, may be practiced with comparative safety. Primary closure of the wound prevents new infection, eliminates pain caused by packing, improves the chance for bony union, shortens healing time and results in

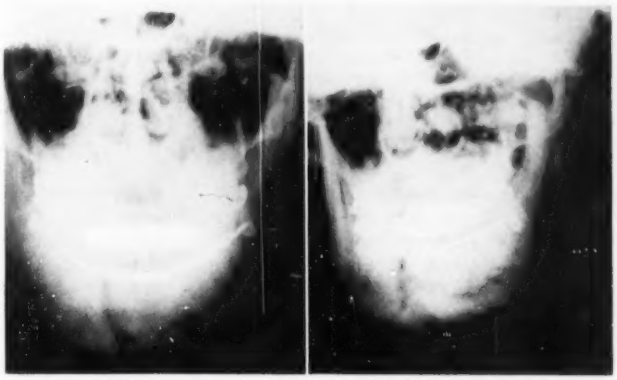


Fig. 3—Roentgenograms taken July 27, 1948. Posteroanterior view of mandible reveals small sequestra at the lower border. Right: Showing progression of osteomyelitis. Fistulous tract was draining

Fig. 4—Left: Roentgenograms taken August 4, 1948, just previous to surgery, revealing destruction of bone at the lower border of the mandible and involving the left lateral incisor and cuspid. Right: Amount of involvement has increased but little since July 27. The left central and lateral incisors and cuspid were involved and were extracted at the time of surgery

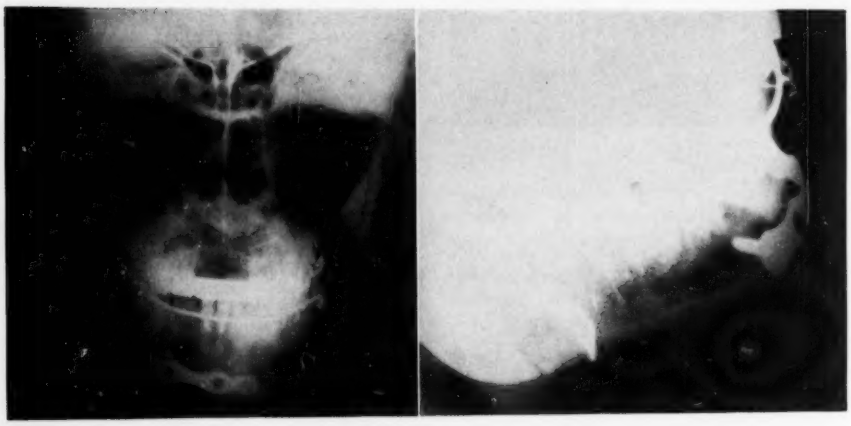


Fig. 5—Left: Posteroanterior view taken August 16, 1948, showing bone plate in position. Bone graft is not clearly visible. Right: Left lateral view of mandible showing bone plate in position after surgery and bone graft

minimal scar formation. By the use of the Lane plate and bone graft, the fragments are maintained in proper position and good occlusion is established. The space created by sequestra removal is obliterated, and bony union is enhanced.

The patient was dismissed from the hospital on the eleventh postoperative day, which is in contrast to the hospitalization time required by patients with osteomyelitis several years ago. Five weeks after dismissal from the hospital the patient was completely cured. A good bony union had been obtained, the occlusion was excellent and the only defect was a scar under the chin, which was not easily noticeable.—*660 Middlefield Road.*

Extensive spontaneous opening of the antrum following extraction of a tooth: *report of case*

■ *Boaz M. Shattan, D.D.S., New York*

The initial examination of the patient, a healthy white man, aged 29, revealed advanced caries, which required the extraction of many of the remaining teeth. Oral hygiene was extremely poor and chronic gingivitis was generalized. There were no subjective complaints. Roentgenograms revealed no evidence of periapical pathologic changes. The upper left third molar was impacted. (See illustration.)

DESCRIPTION OF OPERATION—The patient was given 1½ grains (0.10 Gm.) of pentobarbital (Nembutal) two hours preoperatively. Procaine hydrochloride with nordefrin (Cobefrin) in 1:10,000 dilution was used wherever extractions were indicated. The extraction of the upper right second molar, the upper left cuspid and the lower left second molar was accomplished uneventfully. After the extraction of the upper left second molar, there was a large spontaneous communication with the antrum, about 2 cm. in diameter, and a fracture of the buccal plate of the alveolus, exposing the floor of the antrum.

Closure of the oral-antral opening was effected with the use of a modification of the technic described by Berger.[1] An incision was made on the crest of the ridge mesial to the socket and carried forward into the mucobuccal fold at about the first bicuspid area. Distally, an incision was made on the crest of the ridge and continued over the tuberosity.

The flap was raised buccally. All loose fragments of bone were removed. The palatal tissue in the tuberosity area was raised slightly to allow for the delivery of the impacted third molar, which was elevated out of its socket. The buccal flap was made free and loose by sharp dissection, in order to approximate the tissue without tension. The sharp bone in the socket area was reduced by means of rongeur forceps and smoothed with a bone file. The tissues in the region of the extraction were "freshened" with scalpel and scissors to give fresh-cut margins along the entire suture line. The wound was closed completely with six No. 000 dermal interrupted sutures. No drains or medicaments were inserted into the wound. Routine precautions were suggested relative to a liquid diet, mastication, oral hygiene, rinsing, smoking, blowing of the nose, and bed rest.

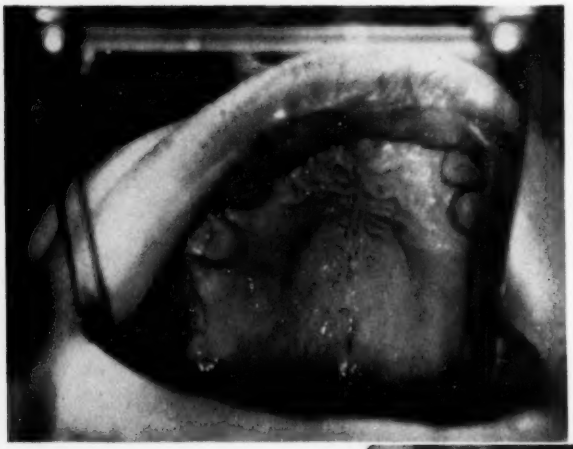
POSTOPERATIVE MEDICATION—Since considerable hemorrhage continued postoperatively, vitamin K (menadione, 4 mg.) was administered, and this medication was repeated on each of the four successive days. Aureomycin therapy (500 mg. every six hours—2 Gm. per day) was immediately instituted.

POSTOPERATIVE COURSE—Examination on the first postoperative day showed a moderate swelling in the upper left molar region. Pain was controlled with ½ grain (30 mg.) of codeine and 5 grains (0.30 Gm.) of acetylsalicylic acid. There was no oozing of blood. The sutures were intact. The patient's mouth could be opened only wide enough to admit one finger.

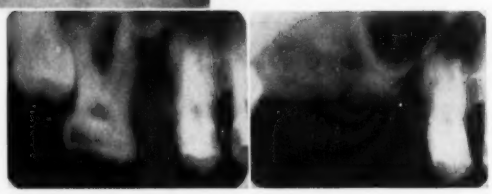
By the fifth postoperative day the mucous membrane had united, and the opening was closed. Trismus had completely disappeared. Intermittent mild pain, which was relieved by administration of 5 grains of acetylsalicylic acid,

From the Division of Oral Surgery, School of Dental and Oral Surgery of the Faculty of Medicine, Columbia University, New York.

1. Berger, A., Oralantral Openings and Their Surgical Correction. *Arch. Otolaryng.* 30:400 (Sept.) 1939.



Appearance of the surgically treated region after removal of the sutures seven days postoperatively



Left: Preoperative roentgenogram of the left molar region. Right: Left upper molar region seven days postoperatively

persisted for six days. The sutures were removed on the seventh postoperative day. (See upper illustration.)

Aureomycin therapy, which was continued for eight days, was accompanied by diarrhea, perlèche and pruritus ani. These symptoms ceased without treatment soon after the administration of aureomycin was stopped.

COMMENT—Although it was not planned, it was deemed advisable to remove the impacted third molar to gain additional tissue for the buccal flap necessary for the plastic closure. The vertical height of the mucobuccal sulcus was reduced only slightly. It is problematical whether the aureomycin aided in the uneventful and prompt healing of the wound. It should be emphasized, however, that here as elsewhere sound surgical technic is of primary consideration and antibiotic therapy is only a supplement thereto.

SUMMARY—The management and plastic closure of an unusually large oral-antral opening following the removal of a tooth in a septic mouth by the sliding buccal flap operation is described. Aureomycin was administered as a precaution.—*501 Madison Avenue.*

Focal infection as viewed by the oral surgeon

INTEREST IN THE PROBLEM of oral infection continues in all branches of health service, as is indicated by the views of an internist published elsewhere in this issue of the JOURNAL. Oral surgeons and general practitioners of dentistry are especially concerned since it is they who must decide finally whether teeth are to be extracted as hopelessly and dangerously infected.

The dentist specializing in the field of oral surgery is closely allied to specialists in other branches of health service. His work brings him into intimate contact with the other dental specialists, the medical specialist, the pathologist and the bacteriologist. As a result of this close affiliation with the various medical specialists, the oral surgeon develops a keen interest in disease processes that involve parts of the human body other than the oral cavity. He observes the effect of dental infection in relation to systemic disease and realizes full well the need for a thorough appreciation of pathology, not only of the oral cavity, but of the entire body. His understanding of the basic sciences as applied to clinical practice affords him an insight into the interrelationship of dental and systemic disease. His knowledge of pathology and bacteriology enables him to understand much of the behavior of various disease processes. Consequently, diagnosis and prognosis assume as important a role in oral surgery as does technical skill.

The modern oral surgeon is well versed in the basic sciences, and having had intensive training in clinical medicine, is in a position to render valuable service in problems of a medico-dental nature. He is a close connecting link between the practitioners of medicine and dentistry and his knowledge of the medical and dental aspects of oralogy assures the best interest of the patient. The well-trained dentist considers the health of the body as a whole. He considers the oral cavity as only a part, but an important part, of the body, a part which is subject to some of the same diseases as affect

This editorial is based on the paper presented before the Combined Section Meeting, ninety-third annual session of the American Dental Association, St. Louis, September 10, 1952.

other organs, and one which frequently manifests the effects of disease located in other organs.

The human body is subject to many puzzling disease processes. Often new thoughts are advanced as to the etiologic factors in the behavior of those processes. Occasionally "sure cures" are heralded only to be found wanting as time passes on. Enthusiasm for these measures then wanes and the pendulum swings back to a less extreme position. Frequently some good develops from the exploration of such ideas and a better understanding and evaluation of the problem results. Such is the history of focal infection.

In 1900 and again in 1910, Hunter[1,2] called attention to oral sepsis, emphasizing its importance as a factor in medical practice. He expressed the opinion, based on clinical observation, that many chronic diseases of middle life are caused by the absorption of small doses of bacterial poisons from localized infections. The advancing of this thought by an eminent physician brought about a change in concept of dental practice. Many physicians, in a desire to alleviate or cure patients with chronic disease, allowed their enthusiasm to carry them beyond the realm of logical reasoning and ordered, on "general principles," wholesale extraction of teeth. As might be expected, many useful and healthy teeth were extracted without benefit to the patient. Many patients, however, who had infected teeth extracted showed improvement, and many were entirely cured of a chronic ailment.

Today there is sufficient evidence to show that a dental focus of infection can and does cause disease in distant parts of the body. Fortunately, dental therapy has made much progress in recent years and many diseased teeth, formerly doomed to extraction, can be retained by improved methods of treatment as healthy, serviceable, masticatory organs. The fact must not be overlooked, however, that the absence of symptoms does not prove the absence of disease. Careful evaluation of a diseased tooth in its relationship to the body as a whole should always remain uppermost in the mind of the oral surgeon in determining whether a tooth should be retained or removed.

Any oral surgeon with even limited experience has observed too many patients recover from secondary foci of infection to regard the subject lightly or to state categorically that the removal of a dental focus of infection has little or no value in the treatment of systemic disease. It is difficult to understand, today, how the presence of a focus of infection can be depreciated and how its elimination can be considered unimportant in the alleviation of certain chronic ailments. The wise physician and his colleague, the well-trained oral surgeon, cannot overlook the beneficial results obtained in everyday clinical practice. Such results are too plentiful to be cast lightly aside.

Bacteremia is a recognized complication of multiple extraction of diseased teeth, and the administration of penicillin to prevent secondary invasion of bacteria and bacterial toxins in susceptible tissues is considered proper treatment. With the recognition of migrating bacteria, who can assert that the slow absorption of toxins from infected teeth cannot cause secondary lesions while the teeth are still in place? To deny that in-

1. Hunter, William. Oral sepsis as a cause of disease. Brit. M.J. 2:215 (July) 1900.
2. Hunter, William. The role of sepsis and antisepsis in medicine. Lancet, Jan. 14, 1911, p. 79.

fected teeth frequently cause secondary infection is to deny that bacterial toxins are dangerous.

The present "tempest in a teapot" about focal infection appears to be in keeping with the great American tradition of building up and tearing down. When the dust of argument has cleared away and logical thinking once again predominates, the many complicated problems associated with focal infection undoubtedly will be studied more carefully than in the past, and when dental infection exists the dentist will continue to eradicate it as a possible cause of secondary infection. The observant practitioner, in his effort to render a true health service, will continue to be influenced by the large number of patients who have shown improvement in health following the removal of infected teeth.

Bacterial toxins, wherever located, are a menace to good health and their removal from the body is advisable. Much has yet to be learned about the behavior of bacteria under varying conditions in different individuals. Dental cesspools should not be tolerated, however, just because it may not be possible to state positively that secondary infection is present or likely to develop at some future time. Bacterial toxins can be crippling and can be fatal. It is the practitioner's duty to prevent disease wherever possible and for him to leave infected teeth *in situ* is betraying the trust that patients repose in him.—*James R. Cameron.*

■ Sectioning Multirooted Teeth

Q.—In the extraction by sectioning of upper molars with widely divergent or unusual roots, I have had difficulty in cutting off the buccal roots and removing the lingual root with the crown. Too often the crown fractures and the three roots require additional separation. I like the technic and would like to perfect it. What do you suggest?

A.—This difficulty arises from cutting off the roots above the trifurcation level. It is helpful to remove a little of the buccal alveolar crest in order to locate the bifurcation of the buccal roots, and cut through them at this point. This leaves the crown intact for controlled removal of the lingual root.

■ Placement of Vertical Incision

Q.—When it is necessary to make a vertical or oblique flap incision from a portion of the arch containing teeth, where is the best place to begin the incision?

A.—In order to prevent periodontal complications in healing, it is best to begin these incisions in the embrasure between the teeth. The papilla can be left with a sufficient base for blood supply. All oblique incisions are made well outside the areas of bone removal so that the flap margins are supported by a sound table of bone when they are accurately returned and sutured to place.

■ Impactions with Underdeveloped Roots

Q.—Although most lower impacted third molars respond well to splitting with a chisel, the procedure is unsatisfactory for those impactions where there are incompletely developed roots. Have you any suggestion for this "ball-in-socket" problem?

A.—It is well to employ versatile methods to solve exodontic problems. The impaction of an incompletely developed lower third molar offers unusual difficulties. It would be helpful to let some of these impacted teeth complete their root formation, but often potential orthodontic problems prohibit this delay. The shock absorber influence of the developing roots prevents the effective use of a chisel for splitting. Without sectioning, these teeth require extensive sacrifice of bone for extraction. We have found them most amenable to sectioning with drills. This will reduce the amount of bone relief required and minimize the trauma of the procedure.

■ Occasional Failure in Block Dental Anesthesia

Q.—Recently I have had several failures in mandibular block anesthesia. Since all the elements of my technic have been standardized and are apparently satisfactory, these failures are annoying. What may be at fault?

A.—The possibilities are limitless. One of the commonest causes of incomplete local anesthesia is a lack of compensation for the anatomic variation among patients. A significant variation appears in the degree of lateral flare made by the ascending ramus in relation to the alveolar ridge and body of the mandible. Many refractory cases are due to a wide flare which places most standard injections into the pterygoid muscle. By palpating the posterior as well as the anterior border of the ascending ramus, one is able to detect the degree of lateral flare and is directed to the sulcus for an effective

inferior alveolar block. In addition, for better orientation of the proper level and anteroposterior distance for this block, we suggest the technic outlined by William A. Cook (J.A.D.A. 42:148 (Feb.) 1951) for the interpretation of anatomic variation in the mandible.

■ Calcified Muscle Tumor

Q.—Not long ago I saw a patient who had myositis ossificans involving the masseter muscle. What brought on this lesion?

A.—The etiology of myositis ossificans of the masseter muscle is unknown. The cases which have been reported usually have a history of trauma to the area. It is, therefore, theorized that a hematoma is formed which subsequently undergoes fibrosis and later calcification. The only treatment which has proved satisfactory for this condition is excision of the affected area of muscle.

■ Bacteriological Studies of Exudate

Q.—When incision of a cyst, abscess or tumor produces drainage, what bacteriological studies of the material will be of value in diagnosis and treatment? Specifically: (1). How should the material be collected? (2). What should be requested? (3). What findings should I expect? (4). What should these findings indicate to me?—*J. S., Detroit.*

A.—1. If the amount of exudate is small, collect it on a sterile swab, place the swab in a sterile test tube and stopper it. If large quantities of pus or serous fluid are obtained, collect a representative amount. Scrapings from the wall of a cyst or abscess are more reliable than pus from the lumen. Get the material to the laboratory as soon as possible. The sooner the media are inoculated, the more likely is the finding to be accurate.

2. Always inform the laboratory of the source of the material, and of your provisional diagnosis, if you have one. If the patient has been receiving sulfonamides or antibiotics, inform the laboratory of this fact so that they may inhibit the action of these drugs in the cultures. If you want the laboratory to check for tuberculosis, actinomycosis, or gas gangrene, tell them so, because otherwise they may overlook these possibilities. Routinely request a "smear and culture for predominant organisms."

3. If the discharge was a thick yellow pus, the organism is likely to be *Staphylococcus aureus*. If the material was thinner, less yellow, it is more likely to be a streptococcus. The exudate of actinomycosis will usually evidence "sulfur granules." The odor may be helpful. *Escherichia coli* has a fecal odor. *Pseudomonas pyocyanea* has a characteristic fruity odor. The anaerobic group of organisms generally produces an odor of putrefaction. The laboratory may report on the smear within a very short time. Cultures may be positive within 24 hours or so, but they may be negative for several days and then ultimately be positive for one or several organisms. In any case, treat the organism specifically when it is found.

4. A brief list of some of the causative organisms in oral infection with the drug of choice in combating each is as follows:

Hemolytic streptococci—
- Group A—penicillin
- Group D—penicillin with streptomycin or dihydrostreptomycin
- Other groups—penicillin

Streptococcus viridans—penicillin

Staphylococcus—penicillin usually, but many forms are penicillin-resistant

Clostridia—serum; penicillin may be effective

Escherichia coli—aureomycin or terramycin

Pseudomonas pyocyanea—streptomycin or dihydrostreptomycin

Actinomycetes—penicillin with sulfonamides

■ Spontaneous Anesthesia of Lower Lip

Q.—What is the importance of sudden spontaneous anesthesia of one side of the lower lip? One of my patients, a 57 year old woman, has this difficulty but has no obvious oral pathology. She has had no recent dental extractions and dental roentgenograms do not reveal any unusual changes at this time.—*F.J.R., Detroit.*

A.—Spontaneous anesthesia of one side of the lower lip without a history of previous injury to the mandibular nerve may portend future serious developments. Carcinoma of the breast, prostate gland, thyroid gland or lung may metastasize to the mandible and appear as a radiolucent central lesion, usually near the mandibular foramen, producing pain or anesthesia. Examination of such a patient should always include a stereoscopic roentgenographic study of the mandible, especially in the region of the mandibular foramen, and a careful complete physical examination to rule out any primary malignant disease. Biopsy of such a region of bone destruction may be necessary to arrive at a definite diagnosis. Occasionally a functional nervous disturbance also will produce this unusual symptom, but it is always advisable to rule out any possible organic lesions prior to approaching the problem from a psychosomatic standpoint.

■ Coronary Heart Disease

Q.—What precautions should be taken when carrying out routine exodontic procedures on a patient with a history of a previous coronary occlusion?—*M. H., Rochester, N. Y.*

A.—Since the essential pathology in coronary heart disease is diminution of the lumen of the coronary vessels, it is of extreme importance to avoid any procedure or medication that might precipitate additional reduction of the lumen. It is therefore advisable to prescribe preoperative sedation in all such cases to prevent undue excitement and apprehension. In all instances, it is wise to avoid using epinephrine in any local anesthetic solution, since this furthers generalized vasoconstriction and increases heart rate and blood pressure. Almost without exception, patients with a history of a previous coronary occlusion can be treated with complete safety if these precautions are followed. The amount of surgery done on any one occasion should be kept down to a moderate degree.

■ Significance of Pulp Stones

Q.—Are pulp stones an indication for extraction of the involved tooth?—*E.R.G., Kansas City, Mo.*

A.—It is generally accepted that the presence of calcified areas within pulp chambers are not an indication of pathologic change requiring surgery. Rarely, these teeth become symptomatic of a degenerative pulpitis and are then removed. Roentgenographic evidence of pulp stones in an otherwise normal tooth is not cause for alarm.

■ Order of Extracting Opposing Impacted Third Molar

Q.—When upper and lower impacted third molars are to be removed on the same side and at the same appointment, is there any order of preference?

A.—All other things being equal, most operators prefer to remove the lower third molar first because its removal is usually more difficult and because the lower operative site will be obscured by bleeding if the upper third molar is removed first.

■ THE PHOTOGRAPHY OF PATIENTS. By H. Lou Gibson. 118 pages with 93 illustrations. Index. Price $5.50. Springfield, Ill., Charles C Thomas, 1952.

It is difficult to find fault with this publication. Page after page is excellently written; description is adequate and detailed. Only the most critical analysis occasionally will indicate that a possible change of lighting would make for correct texture. The second paragraph of page 63 contains an example of this. On page 91, the test for safelights could be improved if the photographic paper were developed in total darkness. These are minor corrections, however; the book is fundamentally sound, well illustrated and carefully prepared. It is highly recommended for individual or collective use.—*Waldemar A. Link.*

■ HEALTH RESOURCES IN THE UNITED STATES. By George W. Bachman and Associates. 276 pages. Index and five appendixes of tables. Price $5.00. Washington, D. C., The Brookings Institution, 1952.

This book brings together in a single, integrated compilation, significant facts on many aspects of the health picture. For anyone whose work or interest requires reference to factual information on health resources this book will prove extremely useful.

The first section of the book presents facts on mortality and morbidity as a measure of the health of the nation. The second part is an inventory of health personnel. The third and largest part is entitled "Facilities and Services." It deals with hospitals, government medical departments, health service in industry, and the various public and private programs designed to control specific diseases. The results of two recent surveys of industrial health programs are discussed at considerable length.

Four pages are devoted to a discussion of the number and geographic distribution of dentists, age of dentists, number of dental schools and students, specialists, and sex and race of dentists. The appendix contains tables showing the distribution of dentists, dental schools and students by state, average age of dentists by state, and the number of persons dentally ill reported in two morbidity surveys.

Fluoridation of public water supplies is discussed as an example of an environmental control program which contributes to the promotion of health. Included is a table showing, as of July 15, 1951, the number of communities fluoridating, the number with fluoridation approved but not begun, and the number of public water supplies in each state.

A 1951 survey of industrial health programs by the National Association of Manufacturers showed that out of 3,549 companies, 84 provided some kind of dental care to their employees. However, although only 2.3 per cent of the companies had dental programs, these covered 10.5 per cent of all employees, because more of the larger plants had such programs. In a 1950 survey of 569 industrial plants, made by The Brookings Institution with the cooperation of the American College of Surgeons, 63 indicated they employed dentists.

Inasmuch as this study covers virtually all health professions and semi-professions, the coverage of any one profession is necessarily limited to salient points. In the discussion of dental personnel, no mention is made of the important part played by dental technicians in the provision of dental care to the American people. In the evaluation of the health of the nation, no mention is made of the incidence of dental disease. As an extensive rather than an

intensive study of health resources, however, for many people this book will be of great value.—*B. D. Moen.*

■ OLD INSTRUMENTS USED FOR EXTRACTING TEETH. By Sir Frank Colyer. 246 pages with 283 illustrations. Bibliography. Index. Price $8.50. London and New York, Staples Press, 1952.

Sir Frank Colyer has encompassed within a small book of 246 pages an exhaustive study of all types of extraction instruments employed professionally from earliest times to the early nineteenth century. The chapter titles list pelicans, elevators, keys, modified forms of the key, screws, forceps, and instruments for the perpendicular extraction of teeth. The numerous illustrations (283), the descriptions of instruments, and the extensive bibliography in this book furnish all the data that any student of the history of extraction should need concerning the instruments employed.

The work is not, however, a complete history of the removal of teeth, for it makes no attempt to deal with the circumstances in which these instruments were used, the reasons for one instrument's superseding another, and the effect of the introduction of anesthesia on extraction technic and instruments. Only to a limited extent does it deal with the technic of using the instruments, their advantages, and their shortcomings. However, the author has completed the task which he set for himself, and the book cannot be too highly praised as a definitive account.

Very little helpful information has been omitted. Since illustrations are of the utmost importance, the failure to include Andrée's diagram showing the mechanics of the pelican and of the key in use (1784) may be regretted. Also Aitken's quaint illustration of the application of the key (1771) would have been very welcome. Plates showing the beaks of Cyrus Fay's "anatomical" forceps and the beaks of Josiah Flagg's "anatomical" forceps merit inclusion. Fox's engravings depicting the right and the wrong ways to use the key and his cuts illustrating the extraction of the third molar, the first molar, and the bicuspid by means of the key would have cleared up those points.

To the extensive bibliography might well have been added the following: the excellent article by L. Molnar, "Über die Entwicklung der Zahnextractionsinstrumente," in *Correspondenz-Blatt für Zahnärzte*, 52:341, 395 (1928); the section of Karl Sudhoff's *Beitrage zur Geschichte der Chirurgie* (1914-1918) dealing with the origin of the pelican and *überwurf*; Maurice Fay's article on the forceps of Cyrus Fay, in *Bull. Soc. Française d'Hist. Méd.*, 2:174 (1903); and Josiah Flagg's article on the forceps of his design, in *Medical Magazine* (Boston), 3:154 (1834).

The reviewer disagrees with the author on one point. The pelican and *überwurf* (in French, *levier droit*) have a close superficial resemblance to each other, but in their mechanical operation they are quite distinct and should not be confused, as in many cases they are in the legends of illustrations in the text. The hook-arm of the pelican swung in a horizontal plane and the bolster was placed against some tooth other than that to be extracted; with the *überwurf*, the hook-arm swung in a vertical direction, with the hook in line with the shaft when in use, and the bolster was placed on the ridge at the base of the tooth to be extracted. Counterparts of both these instruments are to be found in different types of the cooper's tool from which their design was probably adapted.—*George B. Denton.*

■ DENTISTRY FOR CHILDREN. By J. C. Brauer, W. W. Demeritt, L. B. Higley, Maury Massler and Isaac Schour. Third edition. 454 pages with illustrations. Price $10. New York, Blakiston Co., 1952.

The latest edition of this well-known book on pedodontics by Brauer and others covers most of the phases of dentistry for children. It provides current information in most respects and gives the student a basis for the establishment of sound dental health practices for children.

The chapter on "Dental Caries" has been rewritten by Maury Massler and presents a

clear, up-to-date discussion of this disease. Also, a number of better illustrations for the chapter on operative dentistry for deciduous teeth have been included by Brauer. A chapter on "Removable Denture Prosthesis" by W. W. Demeritt which is well organized and fairly complete has been added to Part II.

In the section of the book devoted to the technical procedures in dentistry for children, the chapter on "Oral Surgery for Children" presents sound fundamentals for the successful practice of oral surgery for young patients. Brauer points out the need for making a surgical appointment as easy and pleasant as possible, since often it is the child's introduction to dentistry. Usually the extraction of a tooth is a traumatic experience for the child, and mismanagement may spoil a potentially excellent patient. Acute and chronic infections involving deciduous teeth and the scientific treatment of these problems are discussed. Brauer expresses concern over the retention of infected deciduous teeth for the purpose of maintaining space. In describing the technics involved in the removal of deciduous teeth, he emphasizes the need for taking routine preoperative roentgenograms of firmly retained deciduous teeth. He discusses the common anesthetics employed in children's dentistry and expresses a preference for ethyl chloride when a general anesthetic is required.

This new edition is well written but it is sketchy in certain sections. Brauer expresses the hope that the student will not limit himself to the actual material in the book, but will review articles listed in the bibliography.—*W. E. Brown.*

■ Die Rationalisierte Apektomie (The Rationalized Root Resection). By A. P. Sargenti. 64 pages with 51 illustrations. Bern, Switzerland, Hans Huber, 1951.

The author claims that root resection is not practiced enough for the following reasons: too many instruments may be needed; an assistant usually is necessary; the surgery takes too long, and tissues are often traumatized. The author contends that all of these difficulties can be overcome by a simplified technic. He describes this technic, which he calls "rationalized root resection," in a detailed text and series of photographs.

An incision is made in a straight line occlusally from the apex. Sometimes a vertical incision is made at one end of the straight incision. After the operation, the wound is not sutured; the flap is laid over the area and left to heal by second intention. No chisels are used to open the bone. Instead, a specially-built trephine cuts bone and apex in one operation. Root canal filling is done prior to surgery by mechanically widening the canal and filling it with an ivory-silver root canal point of the same diameter as the root canal reamer last used. The point's apex is cemented into place.

The author claims that this technic overcomes the objections to root canal resection listed earlier. It is quick, reduces trauma and requires only a few special instruments. No assistant is needed, as the operator may use a wound margin holder (hook?) which is held with one hand.

Illustrations of this technic are excellent. Even those who cannot read German can follow the technic by viewing the illustrations. The book is printed well, on good paper.

The author apparently achieves good results although some of his suggestions do not seem to follow sound surgical principles and sterilizing technics.—*Balint Orban.*

■ Antibiotics. By Sir Howard Florey, Ph.D. 35 pages with 22 illustrations. Price $1.50. Springfield, Ill., Charles C Thomas, 1951.

This little book is the printed version of a lecture delivered before the Oxford University Scientific Club on June 1, 1950.

The fundamentals of the bacteriology, chemistry, evaluation and manufacture of antibiotics are covered in elementary terms, suitable for a scientifically literate but not highly specialized audience. Dental applications are not mentioned.

A number of developments are not described, however, because they have occurred since Dr. Florey gave his lecture.

■ CLINICAL DENTAL ROENTGENOLOGY. By John Oppie McCall and Samuel Stanley Wald. Third edition. 384 pages with 475 illustrations. Index. Price $8.50. Philadelphia, W. B. Saunders Co., 1952.

The third edition of this text contains the good clear halftones which characterized the second edition. Convenient in size and easy to handle, this volume serves well as a textbook for the undergraduate and also as a guide for the practitioner, since it contains many helpful suggestions.

The descriptive matter in this book, together with the illustrations, is usually sufficient to convey the intended message to the reader. The interpretative material is presented quite clearly also, but a little more clarity regarding the technic for the conventional intraoral examination would enhance its value.

The schematic diagram of the molars on page 35 scarcely bears out the true anatomic findings. The mandibular molars, for example, are not vertical but are invariably inclined lingually. The degree of inclination necessitates a corresponding change in the vertical angle of projection to avoid foreshortening of the image. This condition is still more pronounced in the diagram of the mandibular bicuspid. In the text, the bicuspid appears to be buccally inclined. Again the technic suggested for projecting this tooth may result in a distorted image.

It is enlightening to note that the authors included chapters on the so-called "long cone technic" and on "cephalometric technic." Both phases of roentgenology are commanding increased attention and such information should be included in a course of instruction.

It is implied in the text that an effort at paralleling the film packet with the long axes of the maxillary molars is necessary only when using the long cone technic for projections. On the contrary, it is always desirable to carry out the effort at paralleling both as far as possible regardless of the target-film distance. Also in this chapter on long cone technic, the value of this technic would have been more evident if there had been several illustrations to demonstrate its value over what is usually referred to as the conventional technic.

The interpretation of abnormal and pathological findings is excellent throughout. On the whole, this is a fine volume to add to any dental library.—*Lee Roy Main.*

■ THE COST OF SICKNESS AND THE PRICE OF HEALTH. By C-E. A. Winslow. World Health Organization Monograph Series no. 7. Index. Price $1.50. New York, Columbia University Press, 1951.

This is one of a series of monographs on world health conditions. It has to do with the organization of health services on local and national levels and includes information on costs for such service. It also deals with the cost of sickness, the interrelationship of poverty and disease, methods of reducing the burden of diseases that are widespread, and the economic results attained.

As in most instances when the World Health Organization deals with its special problems, little is said about the effect the reduction of death rates will have in overpopulated countries where, under present conditions, the multitudes already are not properly fed. There should be more and better co-ordination of health facilities in these areas, and agencies should be established whose function is the increase of the production of food.—*F. C. Cady.*

■ Cancer of the Gums. Charles L. Martin and Edward J. Craffey. Am. J. Roentgenol. 67:420, March, 1952.

Lesions limited entirely to the gums are rare, but a study of 218 consecutive cases of cancer of the mouth revealed such lesions in 87 cases (40 per cent). All the lesions were relatively low-grade squamous cell carcinomas except one which was a basal cell tumor. The average age of the patients was 64.

Low intensity radium needles were used in the treatment and arranged so that all the malignant tissue received doses varying from 6,000 to 12,000 gamma roentgens. When lymph node metastases were present, they were treated by the combined low intensity radium needle and roentgen-ray technic. Forty per cent of the cases were still well after a five-year follow-up. Radiation necrosis was observed in only 12 cases (13.7 per cent); 8 of these remained well for five or more years. Improvements in technic should eliminate most of the irradiation necroses requiring surgery. Low intensity gamma rays are more advantageous than cancerocidal doses of roentgen rays because the latter produce more damage to normal tissue and because treatment with roentgen rays requires daily treatment with a small cone in the open mouth whereas with needles the treatment requires only two procedures, one for their insertion and the second for their removal. —*C. Dean Couch, Jr.*

■ Carcinoma of the Tongue. H. B. Elkins. Am. J. Roentgenol. 68:81, July, 1952.

Ninety-eight cases of carcinoma of the tongue were treated at the University Hospital, Iowa City, Iowa, between the years 1930 and 1944 inclusive. Through the efforts of the Tumor Registry all cases have been followed to death or for a minimum of five years. The cases in this study were predominantly male (78.6 per cent), a fact which may be attributed in part to poor dental hygiene and the use of tobacco. The age spread was from 35 to 87, the average age being 68.8 years.

Syphilis was present in 24.5 per cent of the patients in this series. Of the 24 cases with syphilis in this series only two survived five years; in one of these a new cancer developed on the other lateral margin of the tongue six years after the primary treatment for a persistent luetic glossitis. In this series the most frequent complaint was a "sore" (ulcer) on the tongue. This was the main complaint in 43 cases, 18 of which had associated pain due to infection. Other symptoms in order of frequency were lump on the jaw or the neck, dysphagia, sore throat, leukoplakia, weight loss, bleeding, irritation of the dental plate and wart on the tongue.

The literature is almost uniform in grading the prognosis in carcinoma of the tongue from fairly good if it is on the tip to poor if it occurs on the base. This grading was not valid for this series. Six out of 21 cases with carcinoma in the base of the tongue survived five years. Fifteen out of 58 cases with carcinoma in the lateral margin, one out of four with it in the dorsum and two out of 15 with it in the tip survived the same period of time. There seems to be no explanation other than the smallness of the series for this reversal of the usually quoted survival rates.

The incidence of metastases from cancer of the tongue is notably high. Metastases were present in 36.7 per cent of the patients on admission and developed in 22.4 per cent later. Thirty-nine cases had no known metastases at

any time. Although patients were given individual treatment, the general form of treatment was as follows:

The primary lesion was treated with interstitial radium to give a calculated dose of about 6,000 gamma roentgens. If check films showed a satisfactory distribution, the radium needles were left in place for six days. Occasionally rather severe, early traumatic reaction with pain and swelling was encountered; but, on the whole, this treatment was well tolerated. Combined with this treatment was external roentgen-ray irradiation using 200 kilovolts filtered to a half-value layer of 1.95 cu. mm. Combinations of lateral mandibular and submental fields were used and generally a tumor dose between 2,500 and 3,000 r was given. Metastatic lesions were treated by radical dissection whenever possible. Neither preoperative nor postoperative irradiation was given routinely in these cases. Large inoperable lymph nodes were treated with external irradiation only, as were also extensive lesions often involving the tongue, buccal mucosa, tonsillar pillars and epiglottis.

The most frequent complication proved to be radionecrosis of the mandible occurring in 11 of the 98 cases. In three cases it was the direct result of having teeth extracted from the treated area. Ten patients had bleeding severe enough to require hospitalization and surgical intervention. Other complications were oral fistulas and ankylosis of the temporomandibular joint, the latter always being a poor prognostic sign signifying residual malignancy and rapid death of the patient.

The most important single prognostic criterion is the presence or absence of metastases. The survival rate for patients entering with metastases was 5.5 per cent, for those developing nodes later 22.7 per cent and for those with no known nodes at any time 36 per cent. The presence of syphilis, either treated or untreated, has a highly unfavorable effect on prognosis. A drop from 25 per cent to 8 per cent in survival rate is statistically valid even in this small series. In this series the survival rate, based on a five-year survival period, was 25 per cent.—*C. Dean Couch, Jr.*

■ PERSISTENT TRISMUS DURING ETHER ANESTHESIA. William W. Montgomery. U. S. Armed Forces M. J. 3:309, February, 1952.

An interesting case of trismus resulted from the use of vinyl ether as a general anesthetic agent.

A four year old boy was anesthetized with fresh vinyl ether for a proposed tonsillectomy. He progressed into the first plane of the third stage uneventfully, but the surgeon was unable to open the patient's mouth to insert a gag. The teeth were in tight apposition, and the masticatory muscles were palpably boardlike. Attempts to open the mouth were abandoned after 45 minutes of anesthesia deep enough to relax all other muscles of the child's body.

On the following day the patient was again anesthetized with vinyl ether and was brought to the late second plane of the third stage. Trismus and persistent masticatory spasm were again encountered. After 30 minutes of deep anesthesia, the surgeon injected 3 cc. of 2 per cent procaine hydrochloride into each masseter muscle. Complete relaxation of the jaw occurred about 30 seconds after the injections.

Hysteria may have caused the trismus in this child because of his abnormal fear of the hospital and of the pending operation.—*Bruce L. Douglas.*

■ BURNS OF THE MOUTH. Louis W. Schultz. Am. J. Surg. 83:619, May, 1952.

Burns of the mouth are identical with burns elsewhere on the body with the obvious exception of sunburn. There are slight variations, however, in their treatment. Chemical burns resulting from acids or alkalies should be neutralized as soon as possible with an agent that will not be destructive to the normal tissue. The slough of a burn of the mouth should be removed as soon as possible; and when healthy granulation tissue is present, a split-skin graft may be applied.

Radiation burns from roentgen rays or radium are treated best with watchful expect-

ancy and supportive treatment; they should be allowed to heal before a plastic repair is attempted. Electrical burns of the mouth probably occur most frequently and are limited to the younger generation. Needless to say babies so burned are thrown into shock and should be treated immediately.

The most important factors in the treatment of burns of the mouth are (1) control of pain, (2) prevention of shock, (3) reduction of infection to a minimum, (4) active treatment of denuded area to promote growth of granulation tissue and (5) plastic repair of skin, muscle and mucous membrane at the proper time. Pain produced by a burn is continuous unless the burn is treated. The pain factor alone if not controlled throws the patient into shock.

Shock should be treated by the following methods as indicated: (1) control of hemorrhage; (2) restoration of body heat; (3) restoration of fluid balance by plain water, physiologic salt solution, plasma or whole blood; (4) placement of the patient with his head low and his feet and body elevated and (5) close watch over the patient, particularly over his fluid intake and output, respiration, pulse rate and temperature to guard against an ensuing infection. The currently used antibiotic drugs in the form of penicillin, aureomycin, terramycin and others have lightened the burden of treatment and shortened the course of convalescence.

To promote early stimulation of healthy granulation tissue a complete débridement of the burned area as soon as possible is advisable. Frequent irrigations with physiologic saline are helpful also. Adhesive tape straps diligently and strategically placed with regard to future healing, muscle action, cosmetic result, relaxation of skin and minimum scar tissue formation help to reduce the convalescent period. Burns which destroy the vestibule of the upper or lower jaw and cheek sometimes can be corrected immediately by placing a split-skin graft over a stent of modeling compound or acrylic resin and joining it in place. Widespread alterations in technics have resulted from the advent of the antibiotics, cortisone, ACTH, heparin and other drugs. Their effectiveness has shortened the treatment time and has made the end result more successful.

Much can be done to effect a quicker postoperative recovery by massage of the burned tissues. This stimulation brings about early relaxation, enhanced blood supply, normal draping of tissue, destruction of fibrous connective tissue and normal response to nerve impulse. The nutrition factor for these patients should have some consideration. In most cases a bland, liquid or semi-soft diet is most suitable. —*Herbert J. Bloom.*

■ Combined Operations in the Management of Cancer in the Head and Neck. John O. Vieta and Joseph E. Mule. Am. J. Surg. 83:734, June, 1952.

A review of recent literature indicates that surgery rather than irradiation is receiving increasing emphasis in the management of cancer of the head and the neck. Briefly, this is true for several reasons: (1) more common types of cancer in this region are only moderately radiosensitive; (2) it is impossible to administer a cancerocidal dose of irradiation in the area of possible metastatic spread; (3) surgery accomplishes the same desired end result more quickly and (4) extirpation of the neoplasm can be checked by frozen section during surgery. Many cancers of the upper respiratory and alimentary tract are best treated with combined roentgenological and surgical methods.

Radical surgical treatment of cancer includes excision of the primary lesion and the node-bearing areas and necessitates combined one-stage procedures when possible or excision and dissection in continuity.

Cancer of the lip is best treated by surgery; in the absence of clinically demonstrable node enlargement, a bilateral supraomohyoid neck dissection should be performed. If the nodes of this dissection are positive, a radical neck dissection should be done in a month to six weeks.

Cancer of the gingiva and of the floor of the mouth should be adequately excised along with the contiguous alveolar ridge and the inner table of this bone. This excision should be

combined with at least a supraomohyoid neck dissection on the ipsilateral side. Further evidence of metastasis would indicate a complete neck dissection. Most cancers of the tongue are best treated with radiation. Cancer involving a major salivary gland is best treated by total excision of the involved gland and an ipsilateral radical neck dissection.

The plea is not for more extensive surgery but for adequate surgery. The use of good surgical judgment and the application of modern concepts of preoperative and postoperative care offer patients with advanced cancer of the head and neck a better chance of cure than radiation therapy does.—*C. Dean Couch, Jr.*

■ THE PROBLEM OF THE FRACTURED MANDIBLE. William F. Harrigan. Am. J. Surg. 83:622, May, 1952.

Although the mandible is a strong, dense bone, there are certain sites which are predisposed to fracture; namely, the condylar necks and the angles where the bone is thinnest.

Histologically four regions of reaction are concerned in the average mandibular fracture: (1) the infected zone where polymorphonuclear leukocytes predominate and remain as long as there is infection; (2) the contaminated zone which contains breakdown products of leukocytes and bacteria and is characterized by lymphocytes or round cell infiltration; (3) the zone of irritation, where osteoclasts but not osteoblasts survive and the toxic matter, though diluted, is still an irritant; (4) the zone of stimulation, a region of constructive cellular activity and of toxic products so diluted that they serve as mild stimulants rather than as irritants, a region where fibroblasts lay down collagenous fibers as a protective barrier and where osteoblasts go to work. For callus to be laid down, optimum conditions, that is, lack of infection and complete immobilization, must exist. If these optimum working conditions are not provided, a less differentiated cell, mainly the fibroblast, takes over and brings about fibrous rather than bony union.

In general, fracture cases can be divided into two main categories: those with teeth and those that are edentulous. A third smaller category includes those cases that require special consideration. There may be an overlapping of the third with the two main categories.

The problem of fracture for patients with teeth is relatively simple. Wire fixation in all its modifications is employed. In edentulous patients, usually fractures are treated with acrylic resin splints, direct bone wiring and various combinations thereof. In children fractures are treated in the same way as those in adults. If the teeth are inadequate, a combination of interalveolar wiring is used about the teeth. Whether an upper or a lower approach is used, mechanically it is very difficult to place a medial displaced condyle back in the glenoid fossa and to maintain it there. Open reduction is not justified since good results can be secured with conservative methods and since ankylosis is more likely to supervene if the joint is entered by surgical intervention.

All badly compounded fractures are drained immediately. Teeth in the line of fracture are removed unless they aid in immobilization or their removal might displace the fragments too severely. Malunion is usually caused by improper reduction and immobilization. Nonunion results from infection, movement or both. It is treated by open reduction.

In conclusion, it is agreed that there is no one way to treat all fractures. Each case requires individual consideration. The one basic thought should be to do the job in the simplest way possible.—*Herbert J. Bloom.*

■ SQUAMOUS-CELL CARCINOMA OF THE FLOOR OF THE MOUTH. W. L. Mattick. Surgery 31: 575, April, 1952.

In 82 cases of squamous cell carcinoma of the floor of the mouth both primary and metastatic neck nodes were present and were treated with some form of radiation. In a five year period the rate of cure for the entire group was 18 per cent. In the same period the rate of cure for those cases without neck node involvement on admission was 35 per cent. In approximately 45 per cent of the cases in this series the patients had no nodes on admission; in half of

the latter cases nodes eventually developed. The incidence of neck node metastasis on admission of patients and the extension of the cancer into the lower jaw appear to warrant an attempt at surgical extirpation of the cancer.

No attempt was made to delve into the problems of prophylactic neck dissection or of the surgical treatment of metastatic nodes when there is a healed primary lesion.—*J. K. Paul.*

■ TUMORS AND PSEUDOTUMORS IN THE NECK. Ralph Gorrell. Am. J. Surg. 84:72, July, 1952.

Swellings in the neck can usually be identified by a careful history and physical examination because each enlargement has certain characteristics and tends to appear in a fairly consistent location. In cases in which the diagnosis is not clear, simple biopsy should be employed.

Certain physical signs are characteristic of different types of lesions. If a mass moves upward on swallowing, it is either an enlarged thyroid gland or it is connected with the thyroid. If a mass moves upward when the tongue is protruded, it arises from the thyroglossal duct. Multiple swellings are almost always found to be enlarged lymph nodes. If pressure over a swelling in the neck causes fluid to appear in the throat, one should be suspicious of a branchial fistula or an esophageal diverticulum. If a mass pulsates in all directions, it is probably an aneurysm. Vascular swellings are compressible whether neoplastic or not. Diverticula of the esophagus or pharynx empty on pressure. Draining fistulas on the lateral side of the neck are commonly due to branchial fistulas; those in the midline anteriorly are due to thyroglossal fistulas. Early inflammation fixes a swelling; in contrast, maligant tumors are not fixed until infiltration occurs. If the edge of a mass is sharp and clearly defined, it may be a benign tumor. Inflammation is suggested by poorly defined margins and malignant tumors by intermediate grades of fixation. Local lymphadenopathy calls for examination of possible sources of infection or primary growth in the tonsils, mouth, ear, scalp and tongue.

Differential diagnosis may be made by the location of the mass or swelling in the neck. A mass or fistula in the midline anteriorly and located in the superior portion of the neck may be a thyroglossal cyst or fistula. A dermoid cyst may be found in this location also. One must not forget that pathologic processes may begin in the thyroid, parathyroid, larynx, trachea, esophagus, upper limits of a large thymus or thyroid embryonic rest and extend some distance before presenting themselves or may metastasize elsewhere. In the submaxillary gland region enlarged lymph nodes are by far the most common swelling. The submaxillary gland itself may be enlarged due to duct obstruction. Mumps is the most common cause of swelling in the parotid area. Parotitis with or without duct obstruction is next most common and tumors of the parotid, third. In the anterior and posterior triangles enlarged lymph nodes again are the most common swellings, due to local infection, metastasis or lymphoma, such as Hodgkin's disease. A branchial cyst is a soft, compressible swelling which gives the sensation of feeling a half-empty hot water bottle. It usually appears anterior to the sternomastoid and is moderately high on the neck. Other types of lesions which may appear here are a tuberculous abscess, a carotid body tumor, an esophageal diverticulum or a cystic hygroma, which can be detected easily as it is the only swelling in the neck which appears brilliantly translucent when a light is placed so that the swelling is transilluminated. In the posterior triangle, fatty tumors, dermoid cysts, sebaceous cysts, infections such as furuncles and carbuncles, cystic hygromas and meningoceles may be found.

Four case reports provide examples of thyroglossal fistula, cystic hygroma, branchial fistula and submaxillary gland stone.—*C. Dean Couch, Jr.*

Announcements

■ American Society of Oral Surgeons Elects Officers, Presents Scientific Program at Meeting

At the thirty-fourth annual meeting of the American Society of Oral Surgeons, held October 8-11 in New Orleans, D. C. McRimmon of Fort Worth, Texas, was elected president; Don H. Bellinger of Saginaw, Mich., president-elect, and Stanley Rice of Beverly Hills, Calif., vice-president. G. V. Boyko of Paterson, N. J., is the new executive council member. Frank B. Hower of Louisville, Ky., was reappointed secretary-treasurer, and Ruth F. Whalen of Richmond, Va., was reappointed executive secretary.

The scientific session opened October 9, immediately following a stag breakfast for members, guests and candidates appearing for examination. The essay program covered three morning and two afternoon sessions and featured eleven essayists and eight discussers. The session closed October 11 with 25 table clinics. Richard H. Lyons of Syracuse, N. Y., delivered the annual Chalmers J. Lyons Memorial Lecture.

Attendance at the meeting exceeded that of previous years. The Society will meet in Houston in October, 1953.

■ Two-Year Course in Basic Sciences to Be Offered by University of Illinois College of Dentistry

The department of oral and maxillofacial surgery at the University of Illinois is now accepting applications for a two-year course in the basic sciences which will begin September, 1953. The course, offered on a full-time postgraduate and graduate basis, will carry credit toward a Master of Science degree.

Information and application forms may be obtained from the department of oral and maxillofacial surgery, College of Dentistry, University of Illinois, 808 South Wood Street, Chicago 12.

■ Tufts College Dental School Announces Courses in Minor Oral Surgery

A course in minor oral surgery will be presented by Daniel J. Holland and staff at Tufts College Dental School each Wednesday evening for eight weeks, January 21 to March 25. The course will be repeated in day sessions June 1 to 5, 1953. Tuition for either course is $125. Further information may be obtained by writing to the Director of Postgraduate Studies, Tufts College Dental School, 136 Harrison Avenue, Boston.

■ Committee to Study Problems in Field of Oral Surgery Organized by American Dental Association

A special committee was recently established by the American Dental Association to study problems in the field of oral surgery, including medical-dental relations and definitions of practice. Otto W. Brandhorst of St. Louis, president of the Association, was appointed chairman and named 10 members to serve on the committee.

Sanford Moose of San Francisco represents the American Society of Oral Surgeons on the committee; James Cameron of Philadelphia represents the American Board of Oral Surgery and Philip N. Northrop of Ann Arbor represents regional oral surgery societies.

Other members of the committee include: Leslie M. FitzGerald of Dubuque, Iowa, president-elect of the American Dental Association; Frank B. Hower of Louisville, Ky., Council on Hospital

Dental Service; Harry Lyons of Richmond, Va., American Association of Dental Schools; William Hodgkin of Warrenton, Va., American Association of Dental Examiners; Bert L. Hooper of Lincoln, Neb., Council on Dental Education; Philip Blackerby of Battle Creek, Mich., Advisory Committee on Dental Specialties, and F. A. Pierson, representative of private general practice.

■ Dental Internship for 1953-54 Offered at Jewish Sanitarium and Hospital for Chronic Diseases

An approved internship which includes oral surgery, exodontics, dental anesthesiology and roentgenology, oral diagnosis and other phases of dentistry is being offered by the Jewish Sanitarium and Hospital for Chronic Diseases, Brooklyn. The internship will extend from July 1, 1953 to June 30, 1954. Applications are now being accepted.

Further information may be obtained from Joseph J. Obst, director of dentistry, Jewish Sanitarium and Hospital for Chronic Diseases, East 49th Street and Rutland Road, Brooklyn 3.

■ Southeastern Society of Oral Surgeons to Meet

The Southeastern Society of Oral Surgeons will meet for its fourth annual meeting March 6-7, 1953, it has been announced by Irwin T. Hyatt of Atlanta, president.

Current officers of the Society are: Frank Jordan of Louisville, Ky., president-elect; George W. Matthews of Birmingham, vice-president; Charles Landis of Chattanooga, Tenn., secretary-treasurer, and Hill Gordon of Miami, Fla., editor.

■ University of Minnesota Announces Graduate Program

Graduate study programs of 2-3 years, leading to the degree of master of science are now being arranged by the University of Minnesota. A program may be arranged with a major in oral surgery, oral pathology, orthodontics, oral medicine, periodontics or restorative dentistry (operative, prosthetics, pedodontics or endodontics) and a minor in one of the fundamental health sciences.

An alternate program in the basic sciences, with special reference to dentistry, leads to the doctor of philosophy degree.

A limited number of fellowships and teaching assistantships are available to the graduate students. Stipends for these appointments range up to $3,600 per year. Further information and application forms may be obtained from the dean of the Graduate School, University of Minnesota, Minneapolis.

■ Seminar Group Founds American Institute of Dental Medicine

At the recent Seminar for the Study and Practice of Dental Medicine, Palm Springs, Calif., the Seminar's Board of Directors announced the founding of the American Institute of Dental Medicine. This Institute has been incorporated as a nonprofit organization under the laws of the State of California, "to further postgraduate education in the field of dental medicine."

The annual seminar will be one of the major functions of the organization. In addition, its members will receive a monthly case history from the field of dental medicine, together with original 35 mm. Kodachrome slide pictures of the oral condition, pertinent laboratory findings, medical background, roentgenograms, histologic slides or other pertinent material, depending on the individual case. The service begins this month, January 1953. Any member of the American Dental Association, American Medical Association or their foreign equivalent is eligible for membership.

Further information may be obtained from Miss M. Lewis, executive secretary of the Institute, 2240 Channing Way, Berkeley 4, Calif.

■ Berkshire Conference in Periodontology and Oral Pathology to Meet June 14-18

The postgraduate division of Tufts College Dental School will conduct an advanced conference in periodontology and oral pathology under the direction of Irving Glickman and staff, June 14-18 at Lenox, Mass. The conference will consist of four days of lectures, seminars and panel discussions on clinical problems, to be presented by outstanding teachers.

In addition to Dr. Glickman, the faculty of the conference will include Col. Joseph Bernier, Louis A. Cohn, Donald Kerr, Paul Losch, Harry Sicher, David Weisberger, Roger Guillemin, Lent C. Johnson and I. Snapper.

The curriculum will include nine courses, arranged so that the mornings and evenings are devoted to professional activities, leaving afternoons free for recreation at the resort site of the conference. Further information may be obtained by writing Berkshire Conference, Tufts College Dental School, 136 Harrison Avenue, Boston 11.

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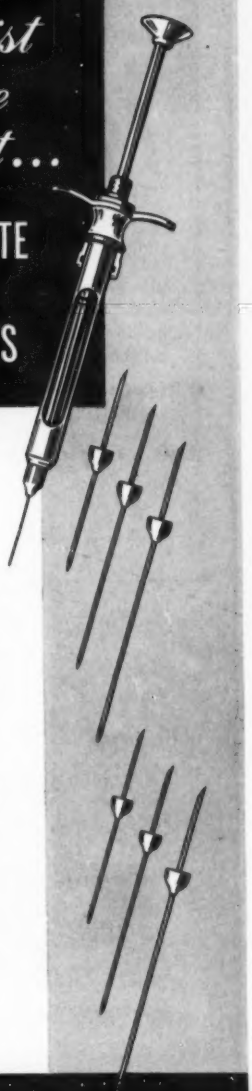

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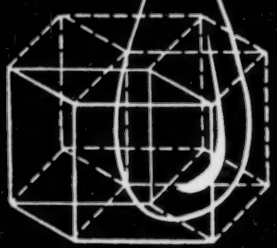

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† Bragdon, C.: *A Primer of Higher Space*. New York, Alfred A. Knopf. 1923. Pate 1.

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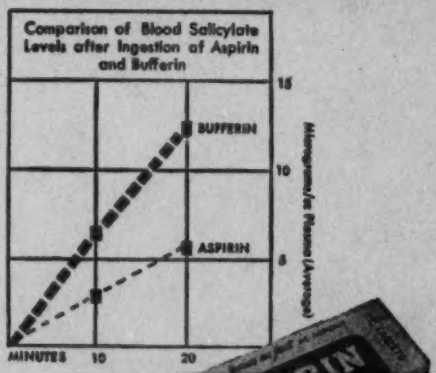

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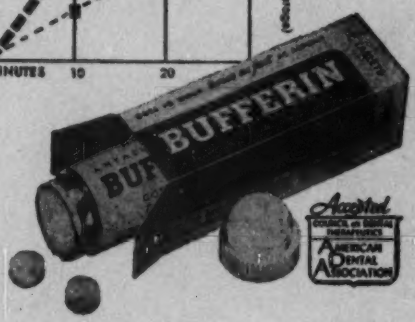

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